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ROYAL ONTARIO MUSEUM
OF
MINERALOGY

ANNUAL REPORT

OF THE

MINISTER OF MINES

FOR THE

YEAR ENDING 31st DECEMBER,

1902,

BEING AN ACCOUNT OF

MINING OPERATIONS FOR GOLD, COAL, ETC.,

IN THE

PROVINCE OF BRITISH COLUMBIA.

VICTORIA, B. C.:
Printed by RICHARD WOLFENDEN, Printer to the King's Most Excellent Majesty.
1903.

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GEOLOGY AND MINERALOGY

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REPORT

OF THE

MINISTER OF MINES,

1902.

:o:

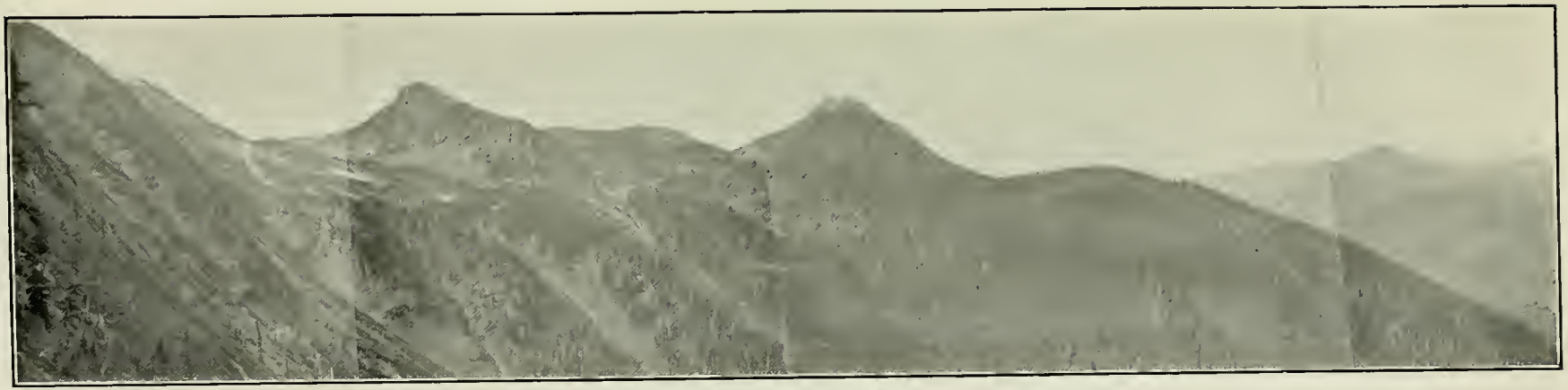
To His Honour the Honourable Sir Henri Gustave Joly de Lotbinière, K.C.M.G.,
Lieutenant-Governor of the Province of British Columbia.

May it please Your Honour:

The Annual Report of the Mining Industries of the Province for the year 1902 is herewith respectfully submitted.

EDWD. GAWLER PRIOR,
Minister of Mines.

Minister of Mines' Office,
March 11th, 1903.



MOUNTAINS AT HEAD OF HORSEFLY RIVER—QUESNEL MINING DIVISION.

FOUR MILES OF 43rd COMPANY'S DITCH, MANSON CREEK—OMINECA MINING DIVISION.

REPORTS

—BY—

WILLIAM FLEET ROBERTSON, PROVINCIAL MINERALOGIST.

—o—

To the Hon. E. G. Prior,
Minister of Mines.

Sir,—I have the honour to submit herewith my Annual Report on the Mining Industry of the Province for the year ending December 31st, 1902.

The following statistical tables give the total mineral output of the Province to date, and show in considerable detail the actual mineral production of the past year, as based on smelter or mill returns; also a summary of the production of each of the last four years, thus illustrating by comparison the progress made in productive mining during this period.

To facilitate comparison with information previously given, I have retained, as closely as was possible, the general form already established for such tables and for the Report.

I have the honour to be,
Sir,
Your obedient servant.

William Fleet Robertson,
Provincial Mineralogist.

Victoria, B. C., March 11th, 1903.

MINERAL PRODUCTION OF BRITISH COLUMBIA.

:o:

METHOD OF COMPUTING PRODUCTION.

In assembling the output for the lode mines in the following tables, the established custom of this Department has been adhered to, viz.: The output of a mine for the year is considered that amount of ore for which the smelter or mill returns have been received during the year. This system does not give the exact output of the mine for the year, but rather the amounts credited to the mine on the company's books during such year.

For ore shipped in December the smelter returns are not likely to be received until February of the new year, or later, and have, consequently, to be carried over to the credit of such new year. This plan, however, will be found very approximate for each year, and ultimately correct, as ore not credited to one year is included in the next.

In the Lode Mines tables, the amount of the shipments has been obtained from certified returns received from the various mines, as provided for in the "Inspection of Metalliferous Mines Act, 1897." In calculating the values of the products, the average price for the year in the New York Metal Market has been used as a basis. For silver 95 per cent., and for lead 90 per cent., of such market price has been taken. Treatment and other charges have not been deducted.

TABLE I.—TOTAL PRODUCTION FOR ALL YEARS UP TO AND INCLUDING 1902.

Gold, placer	$ 64,627,683
Gold, lode	22,049,732
Silver	18,475,882
Lead	10,447,521
Copper	12,256,219
Coal and Coke	58,989,572
Building stone, bricks, etc	2,800,000
Other metals	81,929
Total	$189,728,538

TABLE II.—PRODUCTION FOR EACH YEAR FROM 1890 TO 1902 (INCLUSIVE).

1852 to 1889 (inclusive)	$ 71,981,634
1890	2,608,803
1891	3,521,102
1892	2,978,530
1893	3,588,413
1894	4,225,717
1895	5,643,042
1896	7,507,956
1897	10,455,268
1898	10,906,861
1899	12,393,131
1900	16,344,751
1901	20,086,780
1902	17,486,550
Total	$189,728,538

Table III. gives a statement in detail of the amount and value of the different mineral products for the years 1900, 1901 and 1902. As it has been impossible as yet to collect accurate statistics regarding building stone, lime, bricks, tiles, etc., these are estimated.

TABLE III.

AMOUNT AND VALUE OF MINERAL PRODUCTS FOR 1900, 1901 AND 1902.

	Customary Measure.	1900.		1901.		1902.	
		Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
Gold, placer	Ounces.	63,936	$ 1,278,724	48,505	$ 970,100	53,657	$ 1,073,140
" lode	"	167,153	3,453,381	210,384	4,348,603	236,491	4,888,269
Silver	"	3,958,175	2,309,200	5,151,333	2,884,745	3,917,917	1,941,328
Copper	Pounds	9,997,080	1,615,289	27,603,746	4,446,963	29,636,057	3,446,673
Lead	"	63,358,621	2,691,887	51,582,906	2,002,733	22,536,381	824,832
Coal	Tons, 2,240lbs	1,439,595	4,318,785	1,460,331	4,380,993	1,397,394	4,192,182
Coke	" "	85,149	425,745	127.081	635,405	128,015	640,075
Other materials			251.740		417,238		480,051
			$16,344,751		$20,086,780		$ 17,486,550

TABLE IV.

PRODUCTION OF MINERAL BY DISTRICTS AND DIVISIONS.

NAME.	DIVISIONS.			DISTRICTS.		
	1900.	1901.	1902.	1900.	1901.	1902.
CARIBOO DISTRICT				$ 684,527	$ 538,700	$ 540,395
Cariboo Mining Division	$ 162,000	$ 279,600	$ 340,395			
Quesnel "	510,000	240,000	160,000			
Omineca "	12,527	19,100	40,000			
CASSIAR DISTRICT				467,479	322,949	426,636
KOOTENAY, EAST, DISTRICT				2,855,851	2,746,839	1,477,466
KOOTENAY, WEST, DISTRICT				6,020,783	8,159,662	7,806,399
Ainsworth Division	349,465	331,011	272,967			
Nelson "	787,082	1,244,568	818,494			
Slocan "	2,063,908	1,865,752	1,608,827			
Trail Creek "	2,739,300	4,621,299	4,938,395			
Other parts	81,028	97,032	167,716			
LILLOOET DISTRICT				88,493	48,383	31,429
YALE DISTRICT				1,422,465	3,317,686	2,843,537
Osoyoos, Grand Forks & Kettle River Divisions	1,358,383	3,250,986	2,782,263			
Similkameen Division	4,800	4,680	2,700			
Yale "	59,282	62,020	58,574			
COAST DISTRICTS (Nanaimo, Alberni, W. Coast V. I., Victoria)				4,805,153	4,952,561	4,360,688
				$16,344,751	$20,086,780	$17,486,550

PLACER GOLD.

Table V. contains the yearly production of placer gold to date, as determined by the returns, sent in by the banks and express companies, of gold transmitted by them to the mints, and from returns sent in by the Gold Commissioners and Mining Recorders. To these yearly amounts one-third was added up to the year 1878, from then to 1895 and for 1898 and 1899, one-fifth, which proportions are considered to represent, approximately, the amount of gold sold of which there is no record. This placer gold contains from 10 to 25 per cent. silver, but the silver value has not been separated from the totals, as it would be insignificant.

TABLE V.—YIELD OF PLACER GOLD PER YEAR TO DATE.

1858	$ 705,000	1881	$1,046,737
1859	1,615,070	1882	954,085
1860	2,228,543	1883	794,252
1861	2,666,118	1884	736,165
1862	2,656,903	1885	713,738
1863	3,913,563	1886	903,651
1864	3,735,850	1887	693,709
1865	3,491,205	1888	616,731
1866	2,662,106	1889	588,923
1867	2,480,868	1890	490,435
1868	3,372,972	1891	429,811
1869	1,774,978	1892	399,526
1870	1,336,956	1893	356,131
1871	1,799,440	1894	405,516
1872	1,610,972	1895	481,683
1873	1,305,749	1896	544,026
1874	1,844,618	1897	513,520
1875	2,474,004	1898	643,346
1876	1,786,648	1899	1,344,900
1877	1,608,182	1900	1,278,724
1878	1,275,204	1901	970,100
1879	1,290,058	1902	1,073,140
1880	1,013,827		
		Total	$64,627,683

TABLE VI.—PRODUCTION OF LODE MINES.*

YEAR.	GOLD.		SILVER.		LEAD.		COPPER.		TOTAL VALUES.
	Oz.	Value.	Oz.	Value.	Pounds.	Value.	Pounds.	Value.	
		$		$		$			$
1887			17,690	17,331	204,800	9,216			26,547
1888			79,780	75,000	674,500	29,813			104,813
1889			53,192	47,873	165,100	6,498			54,371
1890			70,427	73,948	*Nil.*	*Nil.*			73,948
1891			4,500	4,000	*Nil.*	*Nil.*			4,000
1892			77,160	66,935	808,420	33,064			99,999
1893	1,170	23,404	227,000	195,000	2,135,023	78,996			297,400
1894	6,252	125,014	746,379	470,219	5,662,523	169,875	324,680	16,234	781,342
1895	39,264	785,271	1,496,522	977,229	16,475,464	532,255	952,840	47,642	2,342,397
1896	62,259	1,244,180	3,135,343	2,100,689	24,199,977	721,384	3,818,556	190,926	4,257,179
1897	106,141	2,122,820	5,472,971	3,272,836	38,841,135	1,390,517	5,325,180	266,258	7,052,431
1898	110,061	2,201,217	4,292,401	2,375,841	31,693,559	1,077,581	7,271,678	874,781	6,529,420
1899	138,315	2,857,573	2,939,413	1,663,708	21,862,436	878,870	7,722,591	1,351,453	6,751,604
1900	167,153	3,453,381	3,958,175	2,309,200	63,358,621	2,691,887	9,997,080	1,615,289	10,069,757
1901	210,384	4,348,603	5,151,333	2,884,745	51,582,906	2,002,733	27,603,746	4,446,963	13,683,044
1902	236,491	4,888,269	3,917,917	1,941,328	22,536,381	824,832	29,636,057	3,446,673	11,101,102
Tot'l	1,077,490	$22,049,732	31,640,203	$18,475,882	280,200,845	10,447,521	92,652,480	12,333,200	$63,229,354

*The information as to production in the earlier years is obtained from the "Mineral Statistics and Mines" for 1896, Geological Survey of Canada.

TABLE VII.—PRODUCTION IN DETAIL OF THE

DISTRICT.	YEAR	TONS.	GOLD—PLACER.		GOLD—LODE.		SILVER.		COPPER.	
			Ounces.	Value.	Ounces.	Value.	Ounces.	Value.	Pounds.	Value.
				$		$		$		$
Cariboo										
Cariboo Division	1899		9,000	180,000						
	1900		8,160	162,000						
	1901		13,980	279,600						
	1902	21	17,000	340,000	19	393	4	2		
Quesnel "	1899		9,665	193,300						
	1900		25,500	510,000						
	1901		12,000	240,000						
	1902		8,000	160,000						
Omineca "	1899		430	8,600						
	1900		626	12,527						
	1901		955	19,100						
	1902		2,000	40,000						
Cassiar										
Atlin Lake Division	1899		40,000	800,000						
	1900	300	22,500	450,000	120	2,479				
	1901	8	15,000	300,000						
	1902		20,000	400,000						
All other Divisions	1899		965	19,380						
	1900		750	15,000						
	1901		1,140	22,800	5	103	82	46		
	1902	100	800	16,000	474	9,797	224	111	6,258	728
East Kootenay										
Fort Steele Division	1899	716	500	10,000			33,516	18,970		
	1900	86,868	500	10,000			960,411	560,303		
	1901	62,934	630	12,600			718,451	402,333		
	1902	3,621	1,650	33,000			114,506	56,733		
Other Divisions	1899	18					1,627	921	397	69
	1900	94	15	300			2,249	1,295	2,147	348
	1901	838	40	800			34,181	19,141	3,272	527
	1902	260			16	331	27,918	13,833	8,048	936
West Kootenay										
Ainsworth Division	1899	3,760			91	1,888	268,165	151,781		
	1900	5,313			28	578	352,167	205,454		
	1901	5,938			63	1,312	324,913	181,951		
	1902	4,939			5	103	320,719	158,916	9,537	1,109
Nelson "	1899	58,302			16,569	342,308	483,659	273,751	1,370,513	239,840
	1900	94,378	30	600	31,612	653,106	108,870	64,098	30,920	5,979
	1901	109,226			32,868	679,340	377,167	211,213	1,599,449	257,671
	1902	77,810			25,116	519,148	273,870	135,703	491,144	57,120
Slocan "	1899	21,507			14	284	1,891,025	1,070,320		
	1900	25,520			5	103	2,121,176	1,237,495		
	1901	25,493			244	5,043	2,276,259	1,274,705		
	1902	21,153			353	7,297	2,223,810	1,101,898		
Trail Creek "	1899	172,665			102,976	2,127,482	185,818	105,173	5,693,889	996,431
	1900	217,636			111,625	2,306,172	167,378	97,648	2,071,865	335,435
	1901	283,360			132,333	2,735,323	970,460	543,458	8,333,446	1,342,518
	1902	329,534			162,146	3,351,558	373,101	184,871	11,667,807	1,356,966
All other Divisions (Revelstoke, Trout Lake, Lardeau.)	1899	294	300	6,000	118	2,439	48,463	27,430	1,120	196
	1900	622	250	5,000	208	4,297	96,416	56,249		
	1901	930	100	2,000	234	4,837	133,774	74,913		
	1902	1,692	100	2,000	652	13,477	241,584	119,705	1,000	116
Lillooet										
	1899	1,557	2,135	42,700	1,300	26,858				
	1900	5,713	1,845	36,905	2,497	51,588				
	1901	4,150	1,304	26,080	1,079	22,303				
	1902	2,882	1,372	27,440	193	3,989				
Yale										
(Grand Forks, Kettle River and Osoyoos Divisions.)	1899	13,084	180	3,600	11,086	229,028	2,719	1,539		
	1900	103,426			18,133	374,628	112,145	65,426	5,672,177	918,325
	1901	396,210	250	5,000	37,388	772,819	241,489	135,234	14,511,787	2,387,849
	1902	521,402	250	5,000	42,745	883,539	219,798	109,910	14,955,582	1,739,334
† Similkameen Div'n. (Vernon.)	1899	1	330	6,600			16	9		
	1900		240	4,800						
	1901		234	4,680						
	1902		135	2,700						
Yale Division (Ashcroft, Kaml'ps.)	1899	538	3,736	74,720	2	45	47	27	1,700	297
	1900	580	2,877	57,542						
	1901	3,374	2,272	45,440	18	370	74	41	39,920	6,431
	1902	3,783	2,350	47,000	6	124	542	239		
Coast and other Districts (Nanaimo, Alberni, W. Coast V. I., Victoria).	1899	14,901			6,159	127,241	24,358	13,787	654,972	114,620
	1900	14,346	703	14,050	2,925	60,430	36,393	21,232	2,193,963	355,202
	1901	27,965	600	12,000	6,152	127,162	74,483	41,710	3,115,872	501,967
	1902	31,802			4,766	98,513	121,841	60,372	2,496,681	290,364
Miscellaneous (other metals, building stone, brick, etc.)	1899									
	1900									
	1901									
	‡ 1902									
TOTALS	1899	287,343	67,245	1,344,900	138,315	2,857,573	2,939,413	1,663,708	7,722,591	1,351,453
	1900	554,796	63,936	1,278,724	167,153	3,453,381	3,958,175	2,309,200	9,997,080	1,615,289
	1901	920,416	48,505	970,100	210,384	4,348,603	5,151,333	2,884,745	27,603,746	4,446,963
	1902	998,999	53,657	$1,073,140	236,491	$4,883,289	3,917,917	$1,941,328	29,636,057	$3,446,675

Iron Ore—Kamloops, 3,727 tons; Coast, 6,290 tons (value included in Miscellaneous).

METALLIFEROUS MINES FOR 1899, 1900, 1901 AND 1902.

LEAD.		TOTALS FOR DIVISIONS.				TOTALS FOR DISTRICTS.			
Pounds.	Value.	1899.	1900.	1901.	1902.	1899.	1900.	1901.	1902.
	$	$	$	$	$	$	$	$	$
						381,900	684,527	538,700	540.395
		180,000							
			162,000						
				279,600					
					340.395				
		193,300							
			510,000						
				240,000					
					160.000				
		8,600							
			12,527						
				19,100					
					40.000				
						819,380	467,479	322,949	426,636
		800,000							
			452,474						
				300,000					
					400.000				
		19,380							
			15,000						
				22,949					
					26.633				
						66,294	2,215,560	1,592,663	222.778
881,167	35,423	64,393							
38,494,077	1,639,848		2,210,151						
29,129,128	1,127,036			1,541,969					
3,017,756	110,450				200,188				
22,653	911	1,901							
81,354	3,466		5,409						
775,016	30,226			50,694					
204.652	7.410				22.590				
						6,187,859	6,020,783	8,159,662	7,716.399
3,588,577	144,261	297,930							
3,366,962	143,433		349,465						
3,788,412	147.748			331,011					
3,083.039	112.839				272.967				
579,245	23,286	879,185							
1,485,899	63,299		787,082						
2,470,350	96,344			1,244,568					
1,680.943	61.523				773.494				
16,660,910	669,768	1,740,372							
19,565,743	826,310		2,063,908						
15,025,759	586,004			1,865,752					
13.651.144	499.632				1.603.827				
		3,229,086							
			2,739,300						
1,045	45			4,621,299					
					4.893.395				
129,884	5,221	41,289							
363,439	15,482		81,028						
391,844	15,282			97,032					
885.734	32.418				167.716				
						69,558	88,493	48,383	31.429
		69,558							
			88,493						
				48,383					
					31.429				
						315,865	1,420,725	3,307,948	2,787.356
		234,167							
102	4		1,358,383						
2,397	92			3,250,986					
13.103	480				2.737.263				
		6,609							
			4,800						
				4,680					
					2.700				
		75,089							
			57,542						
				52,282					
					47.333				
						255,648	450,914	682,839	449.249
		255,648							
			450,914						
				682,839					
					449.249				
		206,400				206,400	251,740	417,238	430.051
			251,740						
				417,238					
					430.051				
21,862,436	$78,870					$ 8,302,904			
63,358,621	2,691,887						$ 11,600,221		
51,582,906	2,002,733							$ 15,070,382	
22,536.381	$824.832				$12.654.293				$ 12.654.293

†Platinum, in 1901, $457; in 1902, $190 (included in Placer Gold). ‡ Building Stone, Brick, &c., $459,000; Iron Ore, $39,051.

TABLE VIII.—COAL AND COKE PRODUCTION PER YEAR TO DATE.

Coal.

YEARS.	TONS (2,240 lbs.).	VALUE.
1836-52	10,000	$ 10,000
1852-59	25,396	101,592
1859 (2 months)	1,989	7,956
1860	14,246	56,988
1861	13,774	55,096
1862	18,118	72,472
1863	21,345	85,380
1864	28,632	115,528
1865	32,819	131,276
1866	25,115	100,460
1867	31,239	124,956
1868	44,005	176,020
1869	35,802	143,208
1870	29,843	119,372
1871-2-3	148,549	493,836
1874	81,547	244,641
1875	110,145	330,435
1876	139,192	417,576
1877	154,052	462,156
1878	170,846	512,538
1879	241,301	723,903
1880	267,595	802,785
1881	228,357	685,071
1882	282,139	846,417
1883	213,299	639,897
1884	394,070	1,182,210
1885	265,596	796,788
1886	326,636	979,908
1887	413,360	1,240,080
1888	489,301	1,467,903
1889	579,830	1,739,490
1890	678,140	2,034,420
1891	1,029,097	3,087,291
1892	826,335	2,479,005
1893	978,294	2,934,882
1894	1,012,953	3,038,859
1895	939,654	2,818,962
1896	896,222	2,688,666
1897	882,854	2,648,562
1898	1,135,865	3,407,595
1899	1,306,324	3,918,972
1900	1,439,595	4,318,785
1901	1,460,331	4,380,993
1902	1,397,394	4,192,182
Total	18,821,196 tons.	$56,845,112

Coke.

1895-6	1,565	$ 7,825
1897	17,831	89,155
1898 (estimated)	35,000	175,000
1899	34,251	171,255
1900	85,149	425,745
1901	127,081	635,405
1902	128,015	640,075
Total	428,892 tons.	$2,144,460

TABLE

SHOWING MINERAL PRODUCTION OF BRITISH COLUMBIA

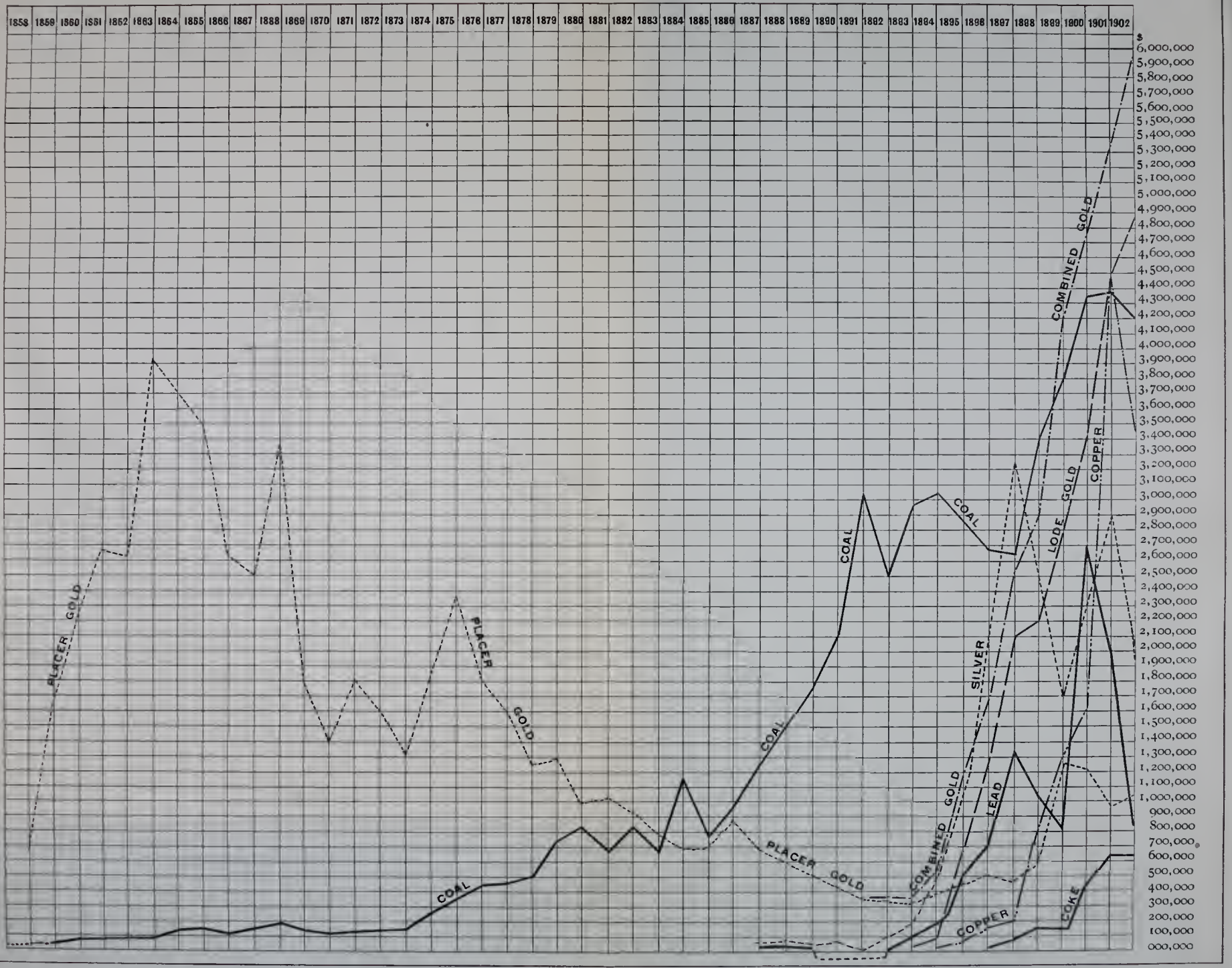


TABLE IX.

Showing Comparative Mineral Production for 1901 of British Columbia and Other Provinces of the Dominion.

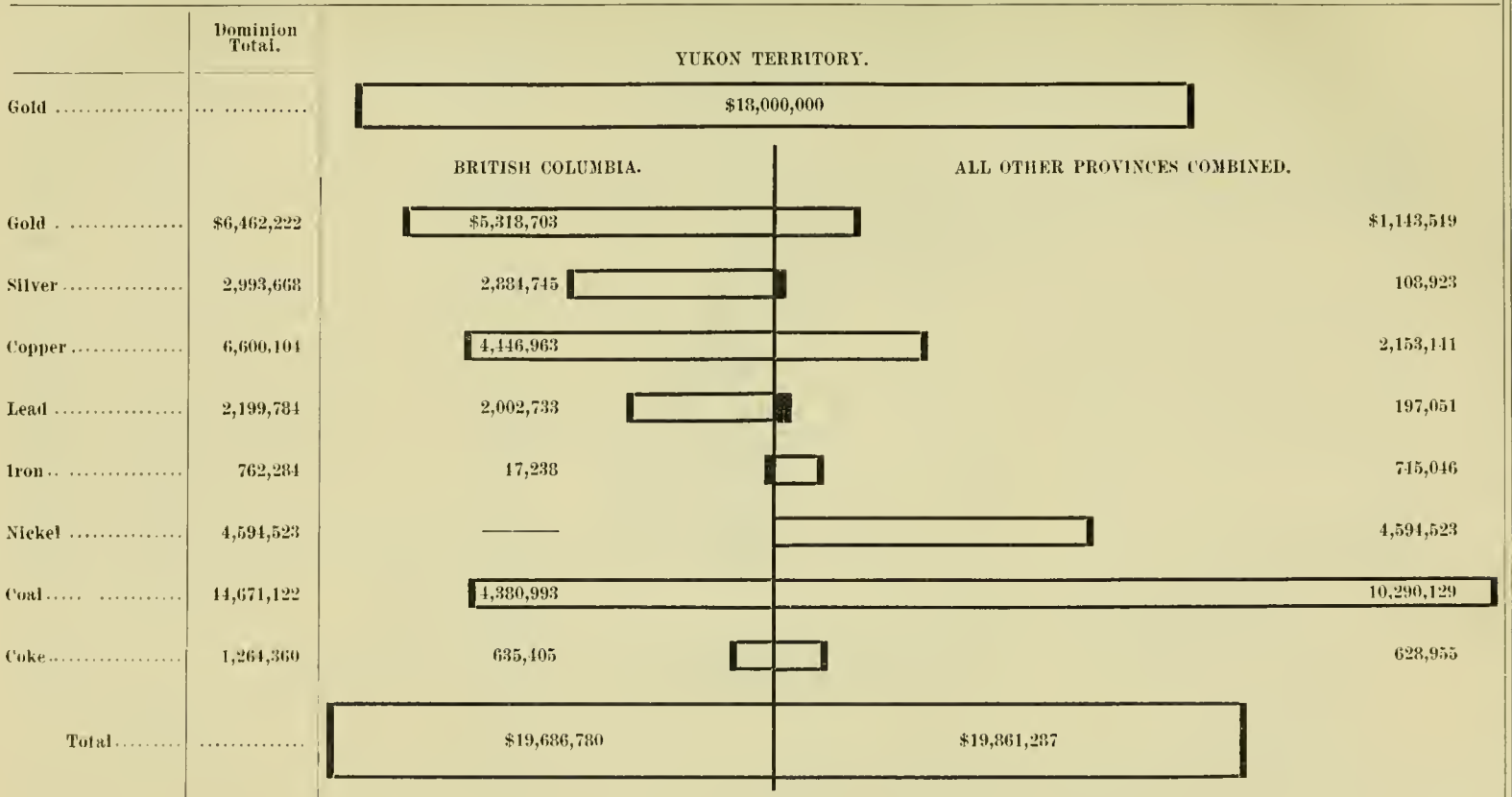
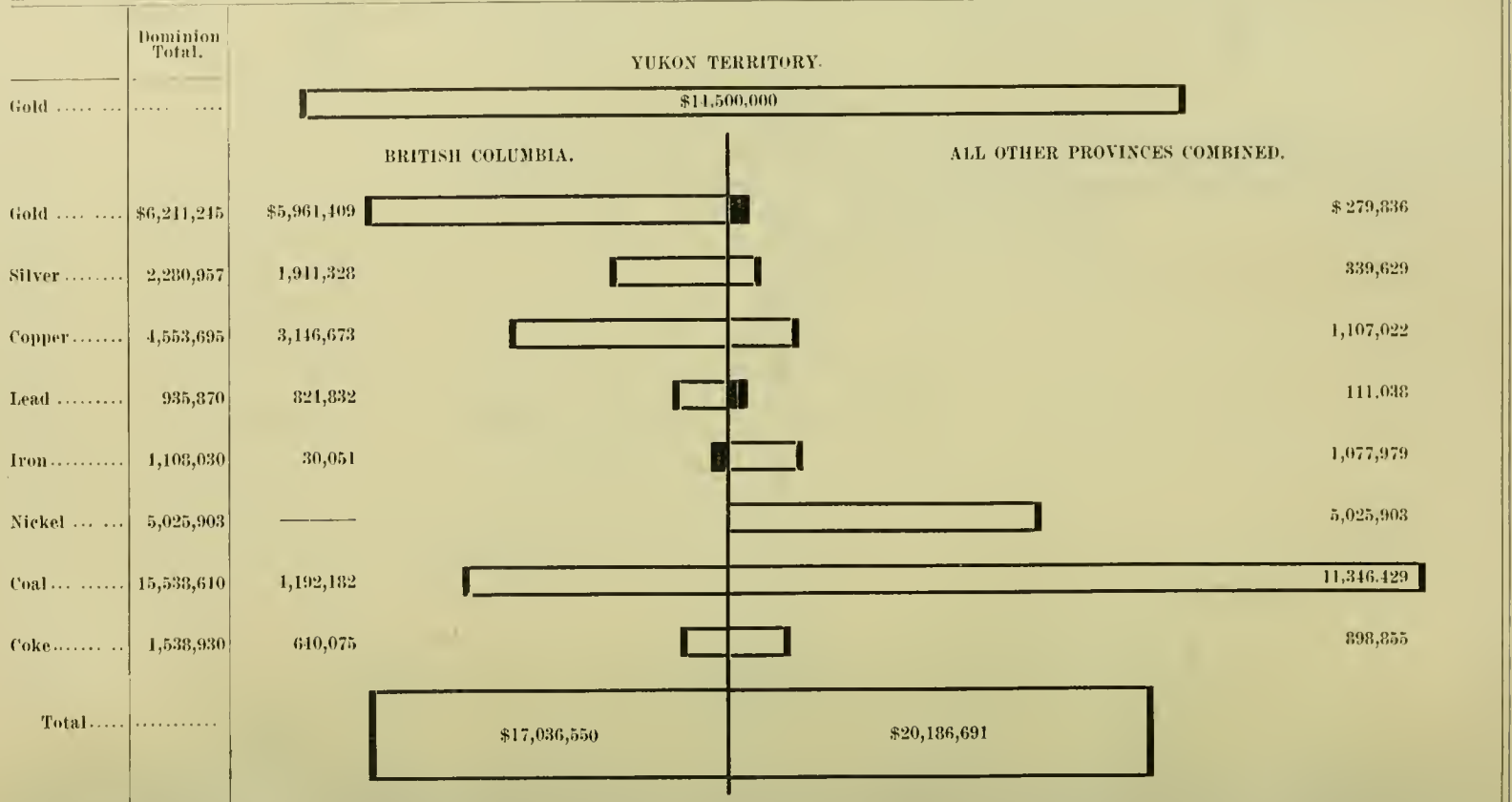


TABLE X.

Showing Comparative Mineral Production for 1902 of British Columbia and Other Provinces of the Dominion.



PROGRESS OF MINING.

The progress made by the Mining Industry of the Province has, during the year 1902, been less marked than usual. If the statistics of production alone are considered, it would appear that no advance has been made, as the gross value of the mineral production for 1902 is less than that of the preceding year, the first time that such a thing has happened since lode mining became an industry of the Province. While it is necessary to face this fact, it is also necessary to learn to what causes the fact is attributable, whether such causes are permanent or temporary, and whether they are removable or not. The diminished production is not due to any failure in the mines themselves, for no wide-spread failure has occurred, and, as a matter of fact, the mines are in a better condition than they were a year ago. The adverse conditions affecting the output appear to have been different in the various branches of the industry, but, as is the way with misfortunes, they came not singly.

The placer mines showed in 1902 an increased production over the previous year of about 10½ %. This is an exceedingly good showing, but is not nearly as good as it would have been had not the rainfall for the year been exceptionally light, causing a shortage of water supply, which sadly diminished the output of the hydraulic mining companies. This shortage of water is, however, only a temporary trouble, and should disappear with another year.

In the coal mining branch of the industry, the Coast collieries have had their principal market, California, invaded by fuel oil produced in that State itself, and yet, although this competition has come upon them suddenly, they have been able to dispose of within 8 % as much coal as last year, and a greater amount than in any year previous to 1901. The Crow's Nest collieries had an unlimited market open to them, but were met with, first, an explosion which crippled their principal mine, followed by strikes which diminished the output, causing the production for the year to be only about half what it should have been, and undoubtedly will be next year. Despite all this, the Coal Industry about holds its own, but, like the "placer," did not make that advance which the conditions of the mines and market would have justified.

The lode mining of the Province has been the branch most sorely beset, and this not owing to any failure of the mines themselves, but to the unprecedentedly low market price of metals which has prevailed during the entire year, beginning, as it did, in the last month of 1901, while it is only in the early months of 1903 that the market has begun to recover. To realise what this drop in the market really was, it is necessary to make a direct comparison, as follows :—

Taking the average value for the whole of each year of the various metals, as quoted on the New York Metal Exchange, we find :

	1901.	1902.		
Copper	16.11	11.62,	a decreased value of	27.3 %
Silver	58.95	52.16,	" "	11.5 %
Lead (in bond)	2.165	1.94,	" "	10.4 %

Now these decreased percentages of market value represent just such a depreciation, as compared with the previous year, in the gross value of the mineral produced, namely, in the gross revenue of the mine, and such depreciation has in many cases wiped away, temporarily, any profit that there may have been in the enterprise. For example, a copper ore marketed in 1901 would have earned a net profit of 27.3 % above all working expenses ; if sold in 1902 it would have made no profit, merely paid expenses. With profits so diminished, the mine-owner produced and sold as little ore as he could afford to, confining his efforts to development

and leaving his ore in the ground until such times as the market should improve, as it was bound to do soon; in fact, at the present writing, the rise in the market price is marked. This drop in the market value of the metals has had a double effect on the statistics, inasmuch as it has reduced the value of such ores as were mined and has constrained the miner to restrict his output. The actual statistics of the mineral production are fully set out in tabular form in the preceding pages, but it may be advisable to briefly explain what these tables show.

Table I. summarises the total mineral production of the Province up to the end of 1902, and shows what amounts of this total are to be credited to the various mineral products. The wealth thus created by the mineral industry amounts to the grand total of $189,728,538, of which some $86,677,415 was derived from gold—the chief product of the Province—and $58,989,572 from coal and coke, with silver and copper following next in order of importance.

Table II. shows the amount which has been contributed each year to the making up of the grand total, and illustrates the growth of the mining industry as far as statistics can. The percentage increases for each year over the preceding year have been—starting with 1896—33 %, 39 %, 4.33 %, 13.66 %, 31.8 %, and in 1901 23 %. For 1902 we have for the first time to record a decrease in value, and, happily, not a very great one, amounting to $2,600,000 as compared with 1901. This decrease is largely due to the lower market values of the various metals, as will be seen by referring to Table III., in which, if we were to credit this year's output at the prices prevailing in 1901, the decrease would nearly disappear, being only $965,742.

Table III. gives in detail the amount and value of the various mineral products for the last three years. As compared with the previous year, the production of 1902 shows, as to market values, for—

Placer gold	an increase of	10.4 %.
Lode gold	"	12.4 %.
Silver	a decrease of	32.7 %.
Copper	"	25.0 %.
Lead	"	58.8 %.
Coal	"	4.3 %.
Coke	an increase of	0.71 %.
Other metals and materials	"	15. %.

It is to be noted that the copper product shows a decrease as to value on account of the low market price of the metal ruling during the year, but that, as regards the quantity of fine copper produced, the year 1902 really shows an increase of 7.4 % over the previous year.

Table IV. shows the gross value of the mineral production of the various mining divisions and districts for the past three years, and illustrates the growth of productive mining in the various parts of the Province. It is especially interesting to note how the output of the placer districts varies from year to year (caused by the weather), and how quickly the Boundary District has risen to prime importance.

Table V. shows the amount of placer gold that has been produced each year since its first discovery in British Columbia, in 1858, to date. The sum total of gold so produced amounts to $64,627,683.

Table VI. shows the yearly production of the lode mines of the Province since 1858. Lode mining, or "quartz mining," as it is commonly called, has not made as good a showing as was anticipated during the first part of the year, a fact which must be admitted, although the reasons already given may be sufficient explanation. The drop in the price of metals has been already referred to, while the position of silver-lead producers will be spoken of in more detail later. The tonnage of ore mined in the Province has been greater, amounting this year to 998,999 tons, as against 920,416 mined in 1901, an increase of 8.6 %.

This great increase is entirely due to Rossland and the Boundary, more particularly the latter, in which district 521,402 tons of ore were mined and smelted.

The following table shows the number of mines in each District that shipped ore during the year 1902, with the number of men employed :—

TABLE SHOWING DISTRIBUTION OF SHIPPING MINES IN 1902.

	No. of Mines Shipping.	No. of Mines Shipped over 100 tons in 1902.	MEN EMPLOYED IN THESE MINES.		
			Below.	Above.	Total.
CARIBOO	1	.....	3	2	5
CASSIAR :					
Skeena	1	1	8	10	18
EAST KOOTENAY :					
Fort Steele	1	1	30	17	47
Other Divisions	4	1	23	8	31
WEST KOOTENAY :					
Ainsworth	12	5	75	44	119
Nelson	14	10	246	170	416
Slocan	40	25	476	161	637
Trail	10	8	710	281	991
Others	9	2	80	39	119
LILLOOET	4	1	12	17	29
YALE :					
Grand Forks, Kettle River and Osoyoos	18	13	373	234	607
Yale-Ashcroft-Kamloops	2	1	24	11	35
COAST	8	7	159	132	291
Total	124	75	2219	1126	3345

It will be seen from this that the number of mines shipping over 100 tons is 3 less than in 1901. Of the non-shipping mines the statistics are very incomplete, as few of them report to the Department and most have no representatives who can be found to give details as to the number of men employed, etc. Returns have, however, been secured from 44 non-shipping mines, and these employed a total of 342 men : 158 above ground and 184 below ground.

COAL.

The coal mining industry has held its own during the year 1902. There is not an increase in production over 1901, but there is no appreciable decrease, and, considering the difficulties with which this industry has had to contend during the past year, this may be considered an extremely good showing. The gross output of coal for the year 1902 was 1,641,626 tons, of which 244,232 tons were converted into coke, leaving a net output of 1,397,394 tons of coal and 128,015 tons of coke. This represents a slight decrease in the coal output and a slight increase in the coke production, as compared with the year 1901, the loss on the one hand just balancing the gain on the other. Of this net output Vancouver Island collieries produced 1,173,893 tons of coal and 20,178 tons of coke, a decrease of 87,851 tons of coal and an increase of 4,780 tons in coke. When it is considered that fully 75 per cent. of the output of the Coast collieries was exported to California, and that this last year has seen the introduction in that State of petroleum fuel to so great an extent, it is remarkable that the falling off in this market should only have diminished the coal output of Vancouver Island some 8 %. The increase of 30 % in the coke output of the Coast has only partly been occasioned by the starting of two smelters on Vancouver Island, as it will be seen by a subsequent table that the greater proportion of the coke produced from the Island collieries was exported. As has been noted before, the output of the Coast collieries is limited only by the market, while with the Crow's Nest Pass collieries the market is in advance of the facilities of output and transportation.

The Crow's Nest collieries produced in 1902 some 223,501 tons of coal for use as such, and manufactured, from an additional 170,460 tons of coal, 107,837 tons of coke, being a slight increase over last year as to net coal output, and a slight decrease as to coke production. These collieries have been exceedingly unfortunate during the past year, as in the month of May, just as the rush of spring shipments was on, a serious accident occurred at the principal mine, the Coal Creek colliery, which has been practically unproductive since, pending repairs and alterations in connection therewith. Following this, there have been one or two "strikes," which have greatly reduced the production of all the three mines operated by the Crow's Nest Pass Coal Company. The Company's plant at the Morrissey colliery, which will in all probability be the greatest producer of these mines, was only completed lately, and the output during the year 1902 was small. There is but little doubt that if the Company had had a year of uninterrupted work the output would have been at least doubled.

Shortages of both coal and coke have occurred during the past year at the smelters and mines supplied by the Crow's Nest Pass Coal Company, and so frequent have these shortages been as to seriously interfere with the running of the smelters, and, consequently, of the mines. Sales of coal were as follows :—

	Tons, Coast.	Tons, Crow's Nest.	Tons, Total Prov.
Sold for consumption in Canada	310,765	111,701	422,466
" export to U. S.	673,524	101,776	775,300
" " other countries	1,508	.....	1,508

The sales of coke were :—

	Tons, Coast.	Tons, Crow's Nest.	Tons, Total Prov.
Sold for consumption in Canada	3,998	81,073	85,071
" export to U. S.	12,016	26,764	38,780
" " other countries	.....	.....	

The additional transportation facilities provided by the completion of the Great Northern Railway into Morrissey, giving direct communication with the United States, coupled with the fact that the import duty into the United States of 67 cents per ton has been removed, would seem to guarantee a very much increased output for the coming year.

GOLD.

The total or combined placer and lode gold output has this year, as usual, maintained an increase, having reached a total value of $5,961,409, the highest gold output ever made by this Province, being an increase over 1901 of $642,706, or about 12 %. This increase has been shared in equally by the placer and the lode gold mines of the Province.

Placer Gold Mining.

The placer gold output for 1902 was $1,073,140, an increase of $103,040 over the preceding year. It is to the small partnerships and individual miners that is due, not only the present increase, but the prevention of what promised to be a serious deficit, inasmuch as the large companies have this year made comparatively poor outputs, for reasons explained later. As an illustration of this fact, the Gold Commissioner of Atlin reports that out of a total sum on

which royalty was collected of $261,985, some $190,652 was produced by the small or individual concerns, and only some $71,162 was produced by the larger companies. This statement is even stronger than appears on the face of it, inasmuch as it is far easier to collect royalty from companies, and it is highly probable that as much as $100,000 produced by individuals escaped taxation.

This is also equally true of the Cariboo District, for in the Omineca Division only small concerns were at work this past year of 1902, yet the output of gold was about double that of 1901. In the Cariboo Division there were produced some $60,000 over the previous year, and this amount is certainly due to the small concerns, as the big companies made little production during 1902. There are in this Division, however, a number of small companies or partnerships, the efforts of which have been very successful during the past year. In the Quesnel Division, in which the yearly output is chiefly made up from the product of one or two large companies, there has been this year a decrease of about $80,000, due to the falling off in production of these companies, while the product of the individual miner remains about constant.

As to the placer gold output of the remainder of the Province, it is almost exclusively produced by partnerships or individuals.

Hydraulicing. The past year has not been a successful one for the hydraulic miner, from causes entirely beyond the control of man. For instance, the largest hydraulic company in the Province, the Consolidated Cariboo, this past year had only water sufficient to run 66 days and to move 690,442 cubic yards of earth, producing $61,395 in gold; while the previous year there was water for 104 days, and 2,420,288 cubic yards were moved, producing $142,274 in gold. The water-shed from which this water was collected was the same as in the previous year, and it is simply a case of insufficient rainfall. The rainfall for some three or four years past has been getting less each year, although it must be pointed out that this state of affairs is not expected to continue, for it seems that such occurrences run in cycles, and that a period of greater rainfall is now almost due. The output, then, of such a company as this, with a given plant, seems to be very nearly in direct proportion to the precipitation on the water-shed.

In the Atlin District, the report of the Gold Commissioner as to gold produced indicates that the hydraulic companies have not yet really settled down to business, and the hope entertained of a large output from this quarter is again deferred for another year. The Thibert Creek Company's property, in the Liard Mining Division, gave promise this year of being a considerable producer, but this hope was frustrated by a tremendous clay-slide, which practically buried the pit. This slide has now been removed, and the gold should be recovered next year.

The auriferous black sands found on the Coast at various points have not been productive this year, for reasons unknown.

Dredging. Dredging for gold has not received the usual amount of attention this past year, only two or three dredges having been at work. On the Quesnel a prospecting dredge was operated for a portion of the year with good results, but made only a small output. Another dredge is reported to have been prospecting on the Thompson river, with what results has not been learned. At Lytton, the old Cobeldick dredge has been working. Here Mr. Turner, the Director who was sent out from England to investigate for the company the working of the dredge, made the discovery that, of the gold dredged up from the bottom, less than 10 % was recovered on the tables, the remaining 90 % going off again with the tailings, although the gold-saving appliances on this machine were about the most complete of any in British Columbia. It certainly appears as

though here is the point of failure in most of the dredging operations in British Columbia, and the realisation of this fact should soon lead to the removal of the difficulty, when, only, will this industry become the success which the conditions seem to warrant.

Lode Gold Mining.

Lode gold mining has this year made a production of $4,888,269, being an increase of $539,666 over the previous year, or about 12½ %. This increase is attributable to the greatly increased tonnage of the mines of Trail creek and the Boundary. The increased tonnage has brought with it lower values per ton of ore mined, but this has been more than compensated for by the cheaper smelting, mining and transportation rates thus rendered possible. Gold is the only metal which may hope to escape the fluctuations of the market, and it is the gold contents of the ore that has enabled most of our copper mines to continue production in the face of a 27 % drop in the price of the latter metal.

The product of lode gold mining in British Columbia has shown the steadiest and most regular increase, and this product is the most valuable which the Province has. It can, however, not be classed as even a separate branch of the industry of mining, inasmuch as the gold is mostly found in combination with other metals, such as copper or silver. A certain amount of this production is derived from stamp milling, etc., but chiefly it is due to smelting.

The following shows approximately that the gold has been derived from—

Direct smelting of copper-gold ores	4,232,948
Combined amalgamation and concentration	655,321
Total	4,888,269

SILVER AND LEAD.

The total amount of silver produced by the Province in 1902 was 3,917,917 ounces, valued at $1,941,328, a decrease as compared with the output of 1901, but practically the same as that of 1900. Of this total amount about 25 % was mined in association with copper, while the remaining 75 % was mainly derived from the silver-lead ores of the Slocan District and of East Kootenay. Included with the Slocan ores are the "dry ores" from the Slocan City Division, which, while as yet forming a small proportionate part of the output of the district, are still ever increasing in volume and importance. Their importance consists in supplying to our local lead smelters an ore with which can be utilised the galena ores which are so plentiful in British Columbia, thus rendering the smelters the better able to meet foreign competition. The decrease in the silver production has been entirely confined to the silver-lead ores, and the drop in the output of this class of ore has been very great. In the Slocan the tonnage has decreased by 4,340 tons, with 1,000 tons further decrease in the Ainsworth Mining Division. It will be noted that the ore shipped from the Slocan Mining Division this past year is higher grade than in 1901, implying that the mines which have diminished shipments are the low grade properties. In the Fort Steele Mining Division, which for the last two years has been the heaviest producer of galena ore, this condition of low silver tenure is most extreme, since the silver occurs only to the extent of ⅓ to ½ ounce to the per cent. of lead. Here the mining of galena has been practically suspended, since the output of 1902 was only 3,600 tons as compared with 63,000 tons of the year previous (1901), and 87,000 tons in 1900. This is not due to the mines nor to local conditions, but is entirely owing to the condition of the market for such lead ores low in silver.

What relief may be had from this condition is very much a question, and even among the lead mine-owners there is a wide difference of opinion on the subject. To the writer it seems that relief from this condition will come permanently only with the establishment and opera-

tion of smelters near the mines, at a central point, together with a customs refinery, in which the silver may be separated from the lead and shipped quickly to market, while the lead, which forms only about 30 % of the value, but 99 % of the weight of the crude bullion, finds its way by the cheapest, though slowest, freight, to the most available market, which will probably prove to be the Trans-Pacific and which yet requires to be developed.

The lead production of the Province in 1902 was 22,536,381 lbs., only about half that of last year, owing to the suspension of the East Kootenay lead mines, but greater, nevertheless, than the production of 1899.

COPPER.

It was remarked last year that the particular feature of interest in 1901 was the great increase in the copper production of the Province, and it might be said that the same feature remains of prime interest this year, or, perhaps, the feature of interest might be more correctly stated as the increased and increasing tonnage of copper ores, of extremely low grade, which are being treated, with apparently a profit, at the various Boundary smelters. The interest which is being taken in the successful working of these ores is more than local, and is causing much attention to be turned to other bodies of ore so low grade as to have been considered valueless. The output of copper for this year was 29,636,057 lbs., an increase of 2,032,311 lbs., or 7.4 % over the preceding year, but owing to the drop in the market price of the metal, the value of the year's output was $1,000,290 less than was that of 1901. The Boundary still yields the greater part of the copper production, with an output of over half a million tons of ore, while Rossland makes the next largest output. The following shows the districts from which the copper output has been obtained this year:—

Boundary	14,955,582	lbs.
Rossland	11,667,807	"
Coast	2,496,681	"
Nelson	491,144	"
Other districts	24,843	"
Total	29,636,057	"

IRON ORE.

A good deal of iron ore has been mined on the Coast during the past year, but the only shipments made have been from Texada island, from which some 6,290 tons of magnetic iron ore, running over 50 % iron, were sent to the iron furnace at Irondale, Washington. From the iron mines at Cherry creek, near Kamloops, some 3,727 tons of magnetite were shipped to Nelson, for use there in the smelter as a flux.

OTHER MINERALS.

Platinum. There was some $190 worth of platinum produced from the Similkameen District this past year. This is the only locality where the metal is saved. The black sands of the Quesnel river, Cariboo District, have been proved to contain considerable quantities of both platinum and osmiridium. Analyses of these sands will be found in the Report on the Cariboo District, but so far little attention has been given to the saving of these metals, which are not retained by the ordinary riffled sluice but require under-currents or some similar appliance.

Tin. This Department has recently received samples taken from a tunnel of a mine in the Cariboo District, and on examination these samples were found to contain tin in very distinct metallic particles. The rare occurrence of tin in the metallic state is recognised, and, while no doubt is felt as to the good faith of the sender of the sample, the discovery will require to be further investigated.

Building Materials.

Of building materials, under which designation are included stone, brick, lime, cement, together with fire clay, fire brick, drain pipe, etc., there are no returns available, and the amount credited to these materials has to be estimated. This has been done as carefully as possible. There are local lime quarries and kilns in almost all parts of the Province, while on the Coast there are a couple of companies making a most exceptionally pure lime from crystalline marble, and this has a considerable foreign sale. Clay for red brick is found everywhere, and local yards supply the local demand. The granite and sandstone quarries situated on the islands of the Coast are splendidly located as regards transportation by water. Fire clay, bricks, drain pipe and tiles are manufactured on Vancouver Island and find a ready local market in the Province.

GENERAL DEVELOPMENT OF THE YEAR.

The following is only a general review of the development of the year, the details of the work done in each district being found in the body of the Report under the proper heading:

In the Atlin District the past season has been very satisfactory, inasmuch as it has demonstrated that the life of the camp is not to be measured by the life of the placers in the creek bottoms. The higher run of gold, noted in the Report for 1900 as occurring under the benches in the triangle between Pine and Spruce creeks, has, after thorough prospecting, been opened up by tunnels and shafts and a number of claims have been worked as drifting propositions pretty well throughout the length of Pine creek above Stephendike, including many of its tributaries, and also on Spruce creek. Between 600 and 700 men have been engaged in mining during the summer, and about half that number will be engaged during the winter on Pine, Gold Run, Otter, Spruce and Boulder creeks. In certain places where the topography admitted of it, the high channel has been attacked by hydraulic methods, with very satisfactory results.

In the Bennett Division there are no placer claims, and little progress has been made on the mineral locations, with the exception of those on the Big Horn river.

The placer mines of the Chilkat District have failed to produce satisfactory results. The mineral claims of Rainy Hollow are still being prospected, but are of too low a grade to admit of being worked at such a distance from transportation.

Of the Teslin Lake Division there is nothing special to note; prospecting is being done in the division with occasional reported finds which seem most promising, but work has not proceeded sufficiently far to tell what the properties may be worth.

In the Stikine Division there are no new developments. A find of coal is reported on Lake Tahltan and samples of the same, which have been received by this Department, indicate it to be a good lignite but not a bituminous coal.

In the Liard Division there has been some activity in the neighbourhood of Thibert creek, where two or three companies are at work, but only one of these is sufficiently far advanced to be expected to produce as yet, and this company has suffered from a clay-slide which filled the hydraulic pit last summer, doing, however, no very serious damage further than wasting the season.

In the Skeena Division there has been very active prospecting going on.

On Observatory inlet and on the northern portion of the Portland canal several properties have been worked, with considerable promise of ultimate success.

On Princess Royal island certain properties have been developed and have made shipments of ore which have given surprisingly high assay returns.

Of the claims on and near Bornite mountain, on the Skeena river, very little news has been received this year.

On Queen Charlotte islands, the coal fields, long known to exist, have been receiving some attention, while in the southern islands of the group information has been obtained that very promising discoveries of bornite copper ore have been made, which received some development during the past season and will be thoroughly investigated this coming year.

No new development has occurred in the New Westminster Division. The Howe Sound copper properties have remained dormant, the low price of the metal not being a stimulant to new copper enterprises.

The copper properties on Texada island have been doing well; the *Marble Bay* has shipped regularly and still has a good showing of ore in the bottom levels. The *Copper Queen*, *Cornell*, *Loyal*, etc., which had suspended shipments, were taken up under bond by Mr. Vaughan-Rhys, who, after much work, has been fortunate in proving up extensions of the old ore-bodies with depth, and has also been fortunate in finding exceptionally good gold values in a quartz vein just behind the *Cornell* engine house.

The Mt. Sicker camp has done little actual producing this past year, as each of the two important properties on this hill, the *Lenora* and *Tyee*, has been awaiting the completion of a smelter to treat its ores, and so has confined its efforts to development. As soon as the Crofton smelter was ready to take the *Lenora* ores, that mine got into financial trouble, since when no mining has gone on, and the *Tyee* smelter did not make returns until January of 1903, so that the results do not appear in 1902.

On the Alberni canal the two copper properties have lain dormant since the drop in the value of copper, and it is not likely that shipments will be resumed until this metal has reached a higher price. As these properties carry little or no precious metals in connection with the copper, the ores feel the fluctuations of the copper market more severely.

The iron mines on Barkley sound have received considerable development, but as yet no shipments of ore have been made.

On the West Coast of Vancouver Island certain copper properties on Quatsino sound have been opened up, equipped with suitable shipping facilities, and have begun making shipments of copper ore to a local smelter. Several other properties in this district have been under development, and it is reported that the results obtained have been very satisfactory.

In the Fort Steele Mining Division the most important mining operations are, of course, those of the Crow's Nest Pass collieries. These collieries have held their own this past year, and but for a serious explosion and several strikes would have undoubtedly doubled their output.

As was noted last year, the condition of the lead ore market was such as to render the mining of lead ores, low in silver, of little or no profit. These conditions have prevailed to such an extent as to practically shut up every galena property in this division. The Trail lead refinery has been a success on a small scale, but has not yet come to the assistance of ores of the lower grades. The question of relief from the conditions has been laid before the Dominion Government, which has the matter now under advisement. The Slocan has suffered similarly, owing to the condition of the lead ore market, but to a less extent, as the silver contents of the ore is higher. The development of "dry ores" in this district is distinctly promising.

In the Nelson Division the mines in the neighbourhood of Ymir have maintained their usual output. The *Yellowstone* has been practically shut down, but a couple of new mines have been opened up in its place.

The *Silver King* (Hall Mines) was shut down by the company, but has been taken under lease by the former superintendent, Mr. Davys, who seems to have been fortunate in finding further ore-bodies.

In the Trail Mining Division (Rossland) there were this year two less mines shipping than in 1901, but the output has increased from 283,360 tons to 329,534, an increase of 46,174 tons. This advance has been obtained chiefly through the increased shipments of the *Le Roi* and *Le Roi No. 2*. The *Centre Star* and *War Eagle* mines only worked about three or four months out of the year, having been practically closed down the rest of the time for some reason. The average grade of the ore of the camp has been maintained throughout the year. The returns this year indicate the same gold assay, a reduced silver assay (which was never very important), and a slightly higher copper assay than last year.

The Boundary District has again this year been the centre of general interest. The immense size of the ore-bodies of the district has been recognised, and it has also been admitted that they are all exceedingly low grade, so much so that it has been a serious question whether they could be worked to a profit. That this problem has been solved is indicated by the immense smelting plants of the Granby, B. C. Copper (Mother Lode) and Montreal and Boston Companies, where the tonnage of ore treated has been so great as to reduce the costs of mining, smelting and marketing to a minimum. The very drop in the price of copper was met by an enlargement of the plants, and in one case a Bessemer converter plant was erected to treat the matte produced in the district.

These companies all claim that they are, and appear to be, making both ends meet on 11.6c. copper. Should the metal rise 3c. per lb., which it probably will, it would mean an additional earning to these companies of over half a million dollars a year. The state of the Boundary District does not differ from that described last year in these pages, but the condition of affairs has been prolonged and emphasised.

In the Similkameen prospecting has continued to be followed with success, but productive mining in that section will not be in advance of railway transportation.

BUREAU OF MINES.

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Work of the Year.

Apart from the routine office work, the following is a brief summary of the work of the Bureau of Mines during the year 1902:—

Provincial Mineralogist

The first portion of the year was largely taken up with preparing the Annual Report and statistics of the preceding year, the publication of which was considerably delayed owing to the stress of work occasioned by the protracted session of the Legislature.

On May the 22nd, 1902, the deplorable explosion occurred in the Coal Creek mines of the Crow's Nest Pass Coal Co. News of this casualty reached Victoria next day and the Provincial Mineralogist was ordered to proceed immediately to Fernie to see if any assistance could be rendered, to report to the Minister the condition of affairs as they then were, and to make an investigation as to the immediate cause of the explosion. This investigation, together with the preparation of the report on the same and the sketches illustrating this report, claimed his attention until the end of July.

On August 9th the Provincial Mineralogist proceeded to Ashcroft and thence by stage to the 150-Mile House, where saddle and pack horses were obtained and a trip made to the headwaters of the Horsefly river, to investigate certain placer discoveries reported as having been made there during the previous fall. The Horsefly river was followed down to Quesnel lake, and the immense auriferous gravel deposits of that region were seen. Thence the Provincial Mineralogist proceeded with pack-train, *via* Keithley creek, over the Snowshoe mountains to the Barkerville District of Cariboo, when most of the properties then working were visited, as were many of the older claims which are now idle, but whose history has made the fame of Cariboo. Only a portion of these great auriferous deposits could be visited in the time available before the winter season closed in, as it does, in these higher elevations, towards the latter part of October, but sufficient was seen to give an idea of the possibilities of the district. On the return trip, *via* Quesnelmouth and the Fraser river, dredging in that vicinity was inquired into, but no machines were at work in that section during the year 1902. The dredge at Lytton, at the junction of the Fraser and Thompson rivers, was inspected. This was the only plant of the description found working.

Throughout the Cariboo District samples were taken of the black sands and sulphurets thrown aside as valueless by the miners. The results of the analyses on these samples are given in the Provincial Mineralogist's Report on the Cariboo District, and show in many cases that considerable values are being thrown away, and that the distribution of platinum and the allied metals, while not general in Cariboo, is much more widespread than has been previously recognised. Attention is specially drawn to the possible values of these by-products from placer mining, in the hope that it will lead to the more careful investigation of such waste products by the miners and others interested.

Arriving at Victoria about the 1st of November, a trip was made to Alberni canal to inspect certain iron deposits, and the smelter at Ladysmith was also visited. The mines at Mount Sicker were also inspected, and later a trip was made to Texada island, to examine the

properties in that locality. The remaining portion of the year was occupied in making notes of the summer trips, in an Examination for Assayers held in Victoria on December the 9th, and with office work.

Considerable difficulty was experienced this year in obtaining statistical returns from a few of the mines. Although about 90 % of the producers make returns promptly, the remainder seem to think that any time will do, not appearing to recognise the fact that statistics are only available for the purpose for which they are required after *all* the returns have been received. These returns, if delayed from a few mines, hold all the statistical tables back, and it is here desired to draw the attention of mine managers to this fact and to urge their prompt co-operation, to the end that these statistics may be published at as early a date as possible.

ASSAY OFFICE.

The following is a summary of the work of the Assay Office, as reported by the Provincial Assayer:—During the year some 1,183 assays or quantitative determinations were made, being a considerable increase over the previous year: these included a number for the Department of Mines, for which no fees are shown. The receipts were as follows:—

Fees for ordinary assays	$132 00
Fees for gold bullion assays	625 00
Fees from Assayers' Examination	330 00
Value of work done for other Departments and not charged for	300 00
Total	$1,387 00

Free Determinations.

In addition to the above, a large number of qualitative determinations were made of minerals and rocks sent into the Department for identification and classification. For this latter work no fees were charged, in accordance with the established custom of the Department, such qualitative determinations being made free with the idea of assisting prospectors and others in the search for new minerals or new mineral districts.

Gold Melting and Assaying.

The value of gold melted, and for which Provincial Government Assay Certificates were issued during the year 1902, was $135,098, representing 173 lots. While the value is less than it was last year, it represents a greater number of small deposits, thus carrying out the purpose for which this office was established, of enabling the miner with a small lot of gold to get it easily and cheaply converted into currency.

The Provincial Government at Victoria, within 24 hours of its receipt, pays in cash the full mint value of all gold dust brought in, enabling the miner to continue his journey, if he so desires, with very little delay, and, furthermore, men arriving from the Yukon without ready money are enabled, by producing their receipt showing that they have deposited a certain amount of gold dust with the Provincial Government for assay, to obtain an immediate advance from any of the local banks. All gold bars are assayed independently by two assayers who check one another, so that the depositor is assured that he will obtain the highest possible value for his gold dust.

The gold dust was received from widely separated localities and varied very much in value, the extremes being $13.50 and $19.60.

Water Analyses. A number of samples of drinking water were analyzed during the year. Among these, samples of water from Okanagan lake, from which it was desired to derive a water supply, were taken at various distances from the land, and it is interesting to note in the accompanying table the decrease in free and albuminoid ammonia, representing impurities, as the distance from the shore became greater.

Analyses of Water from Okanagan lake.

Samples of water taken.	Free Ammonia. Parts per million.	Albuminoid Ammonia. Parts per million.
100 feet from shore	.08	.22
200 " "	.053	.21
300 " "	.045	.130
400 " "	.006	.120

Unknown Element. A considerable number of analyses were made of the water from mineral springs in this Province, and each sample was subjected to a spectroscopic examination. In the case of a particular spring in the Kootenay District, while examining the solid residue with the spectroscope, three lines in the blue end of the spectrum were observed, which did not correspond to the lines given by any of the ordinary elements. The wave lengths of these lines have been calculated as 4327, 4404 and 4490, the first two being strong lines and the last rather weak. These lines were given by the chloride of the element at the heat of the ordinary bunsen flame. The water in question contains only a minute trace of the element in question, and enough has not been yet obtained to attempt any method of separation. This will be done as soon as a sufficient quantity of the water is received.

A number of samples of iron ore from various points on the Coast were analysed, and the results will be found tabulated in the report on these ores which is given elsewhere. (*See* Iron Ores of the Coast of B. C.).

Samples of coal from most of the important seams in the Province were sent in for analyses, the results of which will be found in the Report on Coal Mining (*q.v.*).

This year, again, a number of samples of black sand were examined for the platinum group of metals, with the result that a large number of samples were found to contain appreciable quantities. These results will be found in the Provincial Mineralogist's Report on Cariboo.

Photographs. A large number of lantern slides and half-tone reproductions have been made from the photographs taken by this Department, to be used in the East to illustrate lectures and articles on British Columbia. This cannot fail to bring the resources of the Province before investors.

Mineral Museum. The cases are gradually being filled with specimens. Lardeau and Arrow Lake Mining Divisions are, however, still poorly represented. An effort is being made to obtain a series of rock samples from different parts of the Province and to have them properly classified. This is gradually being done, and is a subject of considerable interest to mining men. More visitors than usual patronised the Museum this past year, many coming from foreign countries.

In addition to his usual duties, the Provincial Assayer visited the principal iron properties on the Coast.

ASSAYERS' EXAMINATION.

REPORT OF THE SECRETARY OF THE BOARD OF EXAMINERS.

SIR,—I have the honour to submit my Annual Report as Secretary of the Board of Examiners for Certificates of Competency and Licence to Practise Assaying in British Columbia, as established under the "Bureau of Mines Act Amendment Act, 1899."

The Act referred to requires that at least two examinations shall be held in each year, and these duly took place, one at Nelson on the 21st of April and following days in a laboratory provided by Messrs. W. F. Teetzel & Co., dealers in assayers' supplies, and the other in the Government Laboratory at Victoria on the 8th December and following days. At the Nelson examination thirteen candidates entered and three passed.

The Board recommended the granting of three certificates under sub-section (2) during the year.

The Board wish to express their thanks to Messrs. Teetzel & Co., for the use of their laboratory.

LIST OF ASSAYERS HOLDING PROVINCIAL CERTIFICATES OF EFFICIENCY UNDER THE "BUREAU OF MINES ACT AMENDMENT ACT, 1899," ON JANUARY 1ST, 1903."

Only the holders of such certificates may practise assaying in British Columbia.

Under section 2, sub-section (1)—

Austin, John W	Vancouver.
Ayres, D. A	Trail.
Barke, A	Rossland.
Bishop, Walter	Vancouver.
Campbell, Colin	Nelson.
Carmichael, Norman	Nelson.
Church, George B	Nelson.
Clarke, Roy H	Rossland.
Cobeldick, Wm. M	Vancouver.
Comrie, Geo. H	Vancouver.
Collinson, H	Ladysmith.
Crerar, Geo	
Davis, A. B. C	Greenwood.
Day, Athelstan	Vancouver.
Dedolph, Ed	Kaslo.
Farquhar, J. B	Vancouver.
Gooding, L. E	
Haseltine, R. S	Rossland.
Hawkins, Francis	Nelson.
Hurter, Ch. S	Vancouver.
Kitto, Geoffrey B	Victoria.
Lang, J. G	Victoria.
Marsh, Richard	Rossland.
Marshall, Wm. Stone	Duncans.
Nicholson, Ch. F	Peterboro.
O'Sullivan, John	Vancouver.
Perkins, Walter G	Grand Forks.
Pickard, T. D	Fairview.
Robertson, Thomas R	Albert Canyon.
Rombauer, A. B	Crofton.
Segsworth, Walter	Nelson.
Sim, Charles John	Victoria.
Synder, Blanchard M	Spokane, Wash.
Synder, Wm. D	Vancouver.
Sundberg, Gustave	Greenwood.
Tally, Robert E	Trail.
Tretheway, John H	Kaslo.
Turner, H. A	Vancouver.
Vans Agnew, Frank	Nelson.
Wales, Roland T	Trail.
Watson, Wm. J	Ladysmith.
Welch, J. Cuthbert	Greenwood.
Whittaker, Delbert E	Victoria.
Widdowson, E. Walter	Trail.
Williams, W. A	Grand Forks.
Wilson, C. M	Sandon.

List of Assayers Holding Certificates of Efficiency.—*Concluded.*

Under section 2, sub-section (2)—

Archer, Allan ..... Ymir.	Lewis, Francis B ..... Grand Forks.
Bryant, Cecil M ..... Vancouver.	Merrit, Charles P ..... Grand Forks.
Blaylock, Selwyn G ..... Fernie.	McArthur, Reginald E ..... Rossland.
Clothier, Geo. A ..... Moyie.	McFarlane, James ..... Vancouver.
Cole, Arthur A ..... Rossland.	McLellan, John ..... Rossland.
Coulthard, R. W ..... Fernie.	Maclennan, F. W ..... Rossland.
Cowans, Fred ..... Silverton.	McVicar, John ..... Ymir.
Dixon, Howard A ..... Toronto, Ont.	McNab, J. A ..... Trail.
Galbraith, M. T ..... Greenwood.	Mussen, Horace W ..... Nelson.
Gilman, Ellis Philip ..... Vancouver.	Outhett, Christopher ..... Kamloops.
Green, J. T. Raoul ..... Nelson.	Shannon, S ..... Ferguson.
Guess, Geo. A ..... Greenwood.	Stevens, F. G ..... Rossland.
Gwillim, J. C ..... Nelson.	Thomson, H. Nellis ..... Trail.
Heal, John H ..... Nelson.	Turnbull, J. M ..... Rossland.
Hilliary, G. M ..... Phœnix.	Watson, A. A ..... Vernon.
Holdich, Augustus H ..... Revelstoke.	Watson, Henry ..... Vernon.
Johnson, William Steele ..... Slocan.	West, Howard ..... New Denver.
Kaye, Alex ..... Atlin.	Wright, Rich. L ..... Rossland.
Lay, Douglas ..... Cranbrook.	

Under section 2, sub-section (3)—

Carmichael, Herbert ..... Victoria. (Provincial Assayer.)	McKillop, Alexander ..... Nelson.
Harris, Henry ..... Nelson.	Pellew-Harvey, Wm ..... Vancouver.
Kiddie T. (Supt. Smelter) .... Ladysmith.	Robertson, Wm. F ..... Victoria. (Provincial Mineralogist).
Marshall, Dr. T. R ..... Victoria.	Sutton, Wm. J ..... Victoria.

Previously issued under the "Bureau of Mines Act, 1897," section 12.

Pinder, W. J. B ..... Atlin.	Thompson, James B ..... Alberni.

EXAMINATION FOR COAL MINE MANAGERS.

Under the provisions of the "Coal Mines Regulation Act," the manager having control and daily supervision over any coal mine in the Province of British Columbia must hold a certificate of competency issued under such Act.

Examinations under and in conformity with the Act were held simultaneously at Nanaimo and Fernie, on October 15th, 16th and 17th, 1902. The papers were prepared in advance and identical examinations were held at these two centres. The general scope and character of the examination are fully set out in last year's Report (1901). Twelve candidates presented themselves for examination and the following eight were successful:—

James McEvoy, Fernie.	Thomas Budge, Nanaimo.
A. R. Wilson, Fernie.	Thomas Mills.
Charles Simister, Fernie.	Alexander Faulds, Nanaimo.
Andrew Colville, Fernie.	James A. Richards.

REGISTERED LIST OF COLLIERY MANAGERS' SERVICE CERTIFICATES ISSUED UNDER SECTION 39, "COAL MINES REGULATION ACT, 1897."

John Bryden, Victoria.
*James Gillispie.
Edward G. Prior, Premier of the Province, Victoria.
Thomas A. Buckley.
*John Dick.
Archibald Dick, Government Inspector of Mines.
James Dunsmuir, M. P. P., Victoria.
James Cairns, Comox, farmer.

"COAL MINES REGULATION ACT, 1877," REGISTERED LIST OF CERTIFICATES OF COMPETENCY.

Name.	Address.	Date.
Shepherd, Francis H	Nanaimo	5th March, 1881.
Gibson, Richard	"	" "
*McGregor, William		" "
Honobin, William	not known	1st May, 1882.
*Muir, Archibald		" "
Little, Francis D	Ladysmith	" "
Martell, Joshua	Nanaimo	" "
*Scott, Robert		" "
Chandler, William	not known	21st December, 1883.
Priest, Elijah	Extension	" "
McGregor, James	Inspector of Mines, Nelson	18th January, 1888.
Randle, Joseph		" "
*Dickinson, Urick Evan		8th January, 1889.
Matthews, John	Union	" "
*Jones, John Bunyan Louis		" "
Norton, Richard Henry		26th August, "
Bryden, Andrew	Extension	30th December, "
Russell, Thomas	Nanaimo	20th April, 1891.
Sharp, Alexander	not known	27th October, "
*Lindsay, William Alfred		4th March, 1892.
Kesley, John	Union	" "
Wall, William H	Nanaimo	30th May, 1896.
Morgan, Thomas	Inspector of Mines, Nanaimo	" "
Wilson, David	Extension	" "
Smith, Frank B	Inspector of Mines, N. W. T., Calgary	" "
*Jamieson, Robert		" "
Bradshaw, George B	Nanaimo	12th June, 1899.
Simpson, William G	Extension	" "
*Fisher, Robert		5th November, "
Hargreaves, James	Crow's Nest, Fernie	5th February, 1901.
Drinnan, Robert G	Nanaimo	" "
Browitt, Benjamin	"	3rd August, "
Stockett, Thomas, Jr	Fernie	" "
Pearson, Robert	"	" "
Cunliffe, John	Extension	" "
*Lamb, Robert B	Fernie	" "
Evans, Daniel	Michel	" "
McEvoy, James		17th October, 1902.
Wilson, A. R	Frank, Alb.	" "
Simister, Charles	Fernie	" "
Colville, Andrew	"	" "
Budge, Thomas	Nanaimo	" "
Mills, Thomas	"	" "
Faulds, Alexander	Nanaimo	" "
Richards, James A		" "

*Dead.

Examinations have been duly held in accordance with the "Coal Mines Regulation Act Amendment Act, 1901."

CASSIAR DISTRICT.

REPORT OF J. A. FRASER, GOLD COMMISSIONER.

I have the honour to enclose herewith my annual report on mining operations carried on in the Atlin, Bennett and Chilkat Mining Divisions of Cassiar District during the year ending 31st December, 1902.

ATLIN MINING DIVISION.

During last winter considerable drifting was done on Pine, Gold Run, Otter, Spruce and Boulder creeks, which, on the whole, paid very fair wages, and the work was so encouraging that this winter a much greater number of men are operating on the streams mentioned, there being from 15 to 20 engaged on Otter and some 50 on Boulder creek, while 125 are working on Spruce, 50 to 60 on Pine and the benches of Willow, and about 70 men with 8 steam plants (boiler, pump and hoist) are operating on Gold Run creek, all with very encouraging prospects.

These operations are proving that the best "pay" is found in the deepest ground away from the present creek beds altogether, and on none of the creeks mentioned has the width of the pay gravel been yet determined, although it has been proven to be at least 600 feet in some places.

There have been no stampedes this year, no new discoveries, and, apart from the "Jap" episode in March last, no labour troubles. Labourers were scarce, so that all who wished could obtain steady employment at good wages. There was only a small number of men actually mining, perhaps 600 to 700 all told, so that the showing per capita is good.

The cancellation of unrepresented leases was a wise and proper course, and will have a salutary effect.

Difficulties as to water and the disposal of "tailings" will continue to present themselves, no doubt, and in more aggravated form as plants are multiplied and begin to crowd each other, but it is difficult to forestall them or to deal with them until an occasion arises.

Some system of survey is very necessary so as to prevent as far as possible the trouble arising from duplication of locations on the same ground.

Systematic prospecting of outlying creeks is being carried on even during the winter, and new discoveries may be announced at any time.

The larger area covered by a placer claim, as the Statute now provides for, will to some extent account for the lesser number of claims recorded.

Pine Creek.

As stated in last year's report, the shallow and more easily worked ground on this creek is pretty well exhausted and the creek proper is practically worked out, but good pay was obtained by the various small "crews" who operated benches here during the open season, as well as by those who drifted into the benches last winter. From 60 to 70 men operated in this way during the summer, but the greater part of the unworked ground has passed into the hands of the hydraulic companies, some of which have demonstrated already that suitable plants, properly installed and intelligently operated, may secure very satisfactory results.

BRITISH AMERICA DREDGING COMPANY.

Of the companies operating, or about to do so, the British America Dredging Company, Limited, O. T. Switzer, general manager, is the first property on Pine creek going up stream. This company owns the *Racehorse* and *Feather Groups* of leases, fifteen in all, and is securing others. Having but recently acquired the property, it has done little this season beyond making preparations for the installation of a powerful dredging plant, which is expected to be in position early next season, and which, if found to work as well here as in other countries, will introduce a new method of mining into this camp, and probably prove very remunerative to the owners.

PINE CREEK POWER CO.

The Pine Creek Power Company, Limited—President, F. T. Blunck; hydraulic superintendent and foreman, M. W. Loveridge—has acquired all the holdings of the Sunrise Hydraulic Mining Company, and in point of territory, plant and work performed takes first place on Pine creek for this season. Nearly half the season was spent by this company in laying pipe lines, cleaning out ditches, and in installing giants and sluices before actual piping operations were commenced. Pit No. 1, on claims purchased by the company on the shallow flat in front of the Discovery townsite, used a No. 4 giant, with a pressure of 90 feet, and paid a fair profit, and with the installation of a hydraulic derrick and an increase of 35 feet pressure next season will be able to do a much larger amount of work. Gold from this pit is generally very coarse and quartzy, and assays 25 to 35 cents per ounce less than the general run of gold found in this vicinity.

Pit No. 2, on the south side of the creek, was operated with a No. 6 giant. Great difficulties were experienced and overcome in disposing of the débris. In spite of this, the results have been altogether successful and profitable. Twenty to eighty feet of loose sand and gravel had to be stripped and run off, leaving only from one to three feet on bedrock to be handled by shovel, the bedrock being kept dry by the use of a water-pressure syphon. A new pit will be opened next season on a higher level and a hydraulic derrick put up.

In Pit No. 3 operations were not commenced until the middle of the season. Here an entire plant was installed, requiring heavy expenditure. Almost immediately on opening up the high rim, yellow oxidised gravel was encountered, similar in every respect to the famous "yellow lead" on Gold Run creek. This run of gravel proved to be from 400 to 600 feet in width and invariably carried high values. The gold is fine and water worn, with no heavy nuggets, and occurs undoubtedly in an old river channel. A hydraulic derrick will be erected in the spring at this pit, and with the increased conveniences at their various workings the Company should make a substantial showing from this time on. The average number of men employed was from 30 to 40.

ATLIN AND WILLOW CREEK GOLD MINING CO.

The Atlin and Willow Creek Gold Mining Company, Limited, Frank H. Brackett, manager, has been somewhat hampered by litigation and other difficulties, and did not operate for the full season. The results of the work done were not as satisfactory as in former years. From 10 to 20 men were employed.

EASTERN HYDRAULIC MINING CO.

The property of the Eastern Hydraulic Mining Company, John F. Deeks, manager, is situated on the south bank of Pine creek, having a frontage thereon of 6,000 feet. Work has been carried on this season with a No. 2 giant under 60 feet of pressure. The average number of men employed was 7. Results have been so encouraging that the owners have purchased

many adjacent claims from individual miners and are rushing preparations for work on an extensive scale next season. In October the construction of a 4½ mile ditch was commenced, and was actively prosecuted until frost interfered in December. This ditch will give a water supply of 2,500 inches at a pressure of from 125 to 175 feet. Twenty-five men, with teams, were engaged on this work. A prospect tunnel is being driven into the bank to demonstrate the width of the ancient channel. In the spring a No. 4 giant and a powerful derrick will be installed, a large force of men put to work, and, in the phraseology of the manager, a "neat fall" clean-up is anticipated.

The owners of the *Ophir Group* of leases on Pine and Gold Run creeks contemplate putting in a plant early next season also. Several smaller outfits, notably the St. Martin's Prospecting Company and the Cariboo Mining Company, on Pine creek, as well as Small & Co., Howard & Bruner, Clark & Co., and Thomas & Co., on Gold Run, are operating both summer and winter with very satisfactory results. The number of men employed on Pine, Willow and Gold Run creeks during the summer averaged about 140 men.

Gold Run.

Only a few crews were operating on Gold Run creek during the summer, as the "pay" lies from 30 to 40 feet deep, and has to be hoisted to the surface to be sluiced. This makes very good winter work, and there are at present about 70 men and 8 steam pumping and hoisting plants operating there in sanguine anticipation of a good harvest in the spring when it is possible to sluice out the dumps.

The Stephendyke Hydraulic Mining Partnership.

Frank Weir, Manager.

Four men were employed all the season, principally in ditching, adding 1,000 feet to the flume and completing other preparatory work. The pay gravels in this property are claimed to be a continuation of the Gold Run lead, and much resemble it in its general characteristics. On the section of Pine creek which flows through the lower end of this ground, 8 to 10 men have found profitable employment all the summer. Near Pine creek the ground is flat and will have to be worked, if at all, by dredging. A point has been selected further up the gulch to allow of a dump, and a temporary connection was made with the Pine Creek Power Company's flume in August. The supply of water thus obtained was intermittent, but enough washing was done to demonstrate that the gravel would pay for hand-working. Next season promises to see the company commence active hydraulic operations with its own water supply.

Spruce Creek.

The individual miners on this creek did considerable drifting last winter, and perhaps 70 to 80 men are doing so this. Very good "pay" is thus obtained, and the distance to which it extends into the banks has not yet been determined. I believe it has been found to extend at least 600 feet across the valley. About 150 miners operated on this creek during the summer, most of them with very satisfactory results to themselves. The greatest trouble on this creek is scarcity of water for sluicing and lack of dump room for tailings, and this will be a continual source of difficulty until water is conserved by reservoir or brought from other sources. Many derricks and hoists are in operation on this creek for the handling of boulders and pay dirt, and from one to two ounces per day per man were realised by many of the operators during the past season, showing that this is a rich stream. Several hydraulic concerns are endeavouring to operate on this creek, but with indifferent success as yet, owing to lack of water and room. Later, when the individual holdings are worked out, I have no doubt the hydraulic companies will receive very remunerative results.

THE CONSOLIDATED SPRUCE CREEK PLACERS, LIMITED.

W. M. Brook, Manager.

This company owns some 16 leases and is acquiring others on Spruce creek. It has under option of purchase about 3,000 feet of flume and 1,000 feet of ditch already constructed, and a number of placer claims, which are already opened up. Active operations are also contemplated on another lease, apart from the first-mentioned lot, on which some 1,200 feet of an open cut, which attains a depth of 16 feet at the upper end without reaching bedrock, have already been dug. On this lease it is proposed to place a separate plant under the management of Mr. W. C. Hall, a well-known and successful local miner. Should the company succeed in installing the larger plant, as is expected early next season, it should be able to make an important showing before the close of 1903.

THE GLADSTONE HYDRAULIC MINING PARTNERSHIP.

(Messrs. Wheelock and McLoskey.)

This company has done a lot of prospecting work, laid flumes and made preparations for working hydraulically, but it has been hampered for want of water and dump. Results of operations thus far have not covered expenses.

THE COLUMBIA HYDRAULIC MINING COMPANY.

A. A. Johnson, Manager; A. A. Cross, Hydraulic Superintendent.

This company worked a considerable force of men during the open season, but as their work principally consisted in prospecting and bedrock flume laying, the proceeds did not cover the expenditure. The average number of men employed was about 15. As the management of this concern did not respond to the request for a statement before closing down and leaving the district for the winter, I cannot say much as to the prospects.

THE CAMP HAMMEL HYDRAULIC MINING PARTNERSHIP.

C. S. Baldwin, Manager.

This partnership has expended $1,250 in sinking shafts and otherwise prospecting the ground during the season. Results were only moderately satisfactory, but improved methods of working will undoubtedly produce satisfactory returns.

THE DOMINION CREEK HYDRAULIC MINING COMPANY.

(Messrs. Lambert and Jackson.)

This company, being unable to dispose of its tailings, has been prospecting its ground by open cuts and drifts. Five men were employed, and the prospects are fairly satisfactory. Mr. C. H. DeWitt also did some prospecting on leasehold property at this point, but without realising expenses or making any returns.

THE BLUE CANYON PARTNERSHIP.

J. Letherdale, Foreman.

Seven men worked all the season on this company's property, principally prospecting, and 120 feet were added to the bedrock flume. The expenditure was about $5,000 for the season. A plant, with friction hoist and pump, will be installed next spring, and the owners have every confidence that the property will then yield handsome returns.

The Atlin Lake Company, Limited.

R. A. Jackson, Manager; C. A. Lambert, Foreman.

Birch Creek.

The local management of this company's affairs changed hands during the winter and the new management found it necessary to do considerable dead work and handle a lot of material which they did not expect would be remunerative, to enable them to obtain the best results later on. Work was commenced on May 1st and was discontinued on August 3rd. A block over 500 feet in length, 50 feet wide and of an average depth of 20 feet, was piped off and results were still not up to expectations. The pressure box and pipe line have been removed 600 feet higher up the creek, and an early start will be made next season on ground which has been thoroughly prospected, and paying wash-ups are assured. Water is not abundant, but, by the aid of dams, piping can be carried on all the season. The aggregate expenditure was $19,000.

Boulder Creek.

This was the "banner" creek of the district from the individual miner's standpoint. From 100 to 125 men were operating by ordinary placer mining methods during the best part of the season, and the results were very satisfactory, both individually and aggregately. Nearly $70,000 was reported for royalty by the individual miners on this creek, and less was refunded than on any other, on account of the output per claim or group not reaching $2,000. The present creek bed proper is pretty well worked out, but, although the banks are steep, the bedrock does not rise, in fact, rather falls away in parts, and although some prospect drifting has been done, none has yet determined how far the bedrock retains this feature, nor how far the pay extends into the banks. Considerable drifting is being done this winter with very satisfactory prospects indeed.

Société Miniere.

On this creek the Société Miniere de la Colombie Britannique, Mr. Henry Maluin, manager, has been operating hydraulically for the past three years, and although it has a large area under leasehold it has thus far confined its operations to individual placer claims acquired by purchase from the original locators. A change was made in the local management of this company last winter, Mr. Henry Maluin being appointed manager, with Mr. Joseph Fall as hydraulic superintendent. This company is possessed of very valuable property, but being located near the flats, and the creek above being very steep, it has been much hampered and damaged by the flood of tailings and débris that inevitably results from the operations above, and much costly dead work has thus been entailed. However, with the improved methods which the management is wisely contemplating, I believe these difficulties will be largely overcome, if not turned to actual advantage and profit, and that a rich harvest will result.

At the commencement of the season the pressure box was removed and the pipe line laid afresh. A pit was opened up early in the spring (160 feet by 50 feet by 60 feet). Bedrock was found to be deeper than anticipated and 10 feet of gravel over the space mentioned had to be taken out by hand. In the autumn the grading was completed for a new bedrock flume 1,400 feet long, 4 feet wide and 3½ feet deep. This flume will be riffled with railroad rails, timber being unable long to withstand the heavy wash, and it will have more grade than the previous one. The gravel is claimed to average $1.25 per cubic yard. Royalty was paid on $24,000 as being the returns for 1902, and, as most of the dead work has now been disposed of, future yields should be largely increased. The average number of men employed was from 20 to 30. Nine men will work all the winter, drifting and proving the ground.

About half a mile above *Discovery* the Boulder Hydraulic Mining Company, under the management of C. D. Newton, put in about 400 feet of bedrock flume, and did sufficient

prospecting to prove that it has some very rich ground, which it intends to work vigorously next season. The aggregate expenditure is about $2,500. From 40 to 50 men are drifting on Boulder creek this winter.

On Ruby creek nothing was done this season, as the lower reaches are covered by leases, but I fully expect to see active operations here next year (1903).

Wright Creek.

On Wright creek the placer miners on the upper reaches did considerable work, with fair average remuneration, but no work was attempted on the lower portion of the creek. The English Counties Hydraulic Mining Syndicate, C. Dubois Mason, manager, owns several leases on this creek, and during the season laid about 600 feet of bedrock flume and did considerable dead work, aggregating altogether about $7,000 expenditure, preparatory for next season, when ample returns for all the labour and expense are sanguinely expected.

Otter Creek.

On Otter creek no work was done below the second canyon, but above this Messrs. Carmichael and Moran who, with their friends, have acquired a considerable area, with commendable persistence prospected the ground last winter by drifting in several directions, and with very excellent results. A stratum of gravel was found under the silt which had been formerly accepted as bedrock. Four men were employed all the summer and a small prospecting plant installed, lumber and supplies being taken in with pack horses. About 2,500 yards were washed, with such promising results that a local syndicate has been formed to work the property extensively. The plant of the Pendugwig Hydraulic Mining Company, on Wright creek, has been purchased by the syndicate and is being moved to Otter creek. Houses and stables have been erected, waggon roads built and all arrangements perfected to have the large plant in operation by May, 1903. From 15 to 20 men are at present working on the ground. Prospecting showed this gravel to average $1 per cubic yard.

The lower part of this creek, for five or six miles, has been held under leases, but, the conditions not having been complied with, these were cancelled. The ground has, however, been to a considerable extent re-located in leases, and will be prospected as a dredging proposition in the near future.

McKee Creek.

On this creek about 20 placer miners operated during the past season, with results equal to the best ever obtained from this singularly rich stream. From two to three ounces per diem per man seems to have been the order wherever bedrock was reached, and many goodly nuggets have been casually picked up besides. The miners here deserved their success, for the creek is difficult to work, and open cuts over 30 feet in depth were made, in some cases through very hard material and among very large boulders: the results, however, amply repaid their perseverance.

Atlin Mining Co.

Several companies own hydraulic leases on McKee creek, but the only one in active operation is the Atlin Mining Company, Limited, Mr. R. D. Fetherstonhaugh, manager, and Mr. M. Brophy, hydraulic superintendent. This company had its plant installed and did considerable work in 1901, but this year required still further dead work in the beginning of the season. This accomplished, the operations were very systematic and successful, and, while making an excellent showing for the time spent in actual mining, gave promise of much better results in future. What they did in the way of actual mining may be told in the words of the manager, thus:

"Mining was started on May 17th and continued for 137 days, during which period 1,200 feet of bedrock flume were constructed, at a cost of over $3,000, and 19,000 cubic yards of

gravel were washed, the average value being $1.10 per cubic yard. Some $17,805 were paid out for wages and supplies, and $1,265 were paid to the Government in rents and royalties."

THE MCKEE CONSOLIDATION.

C. Christopher, Manager.

This partnership owns several leases on this creek. The preliminary operations were detailed in last year's report, but, having some difficulty with the Atlin Mining Company over water rights and ways, an arrangement was arrived at, in consequence of which it was considered inexpedient to enter upon active operations this season. Next season, I am assured by the manager, will see the work in full swing.

THE MCKEE CONSOLIDATED HYDRAULIC, LIMITED.

F. T. Hamshaw, Manager.

This company owns six leases on upper McKee creek, and has spent the season digging ditches, building cabins and prospecting and clearing the ground, preparatory to installing a hydraulic plant which, I am informed, it is intended to bring in early next spring. I am not in a position to say what the results of the prospecting were, except that they are claimed to have been highly satisfactory.

Snake Creek. This is a small creek lying between Otter and Spruce creeks and emptying into Pine creek, near its head. It was probably staked from source to mouth in 1899 and then abandoned. This season it was re-prospected with satisfactory results, and, I believe, it has all been re-staked and undoubtedly will be worked next season.

Dixie Creek. This creek, with others tributary to O'Donnell river, was staked and abandoned during the general rush in 1898-99, although fair values were known to be procurable in many places. This season attention has again been directed to it, with the result that several individual claims and some leases have been located on this and neighbouring creeks, and I have every confidence that systematic prospecting of the ground will reveal the existence of values that will warrant the installation of plants, and operations will be begun which will add a considerable area of auriferously valuable ground to the already proven portions of this important district.

Volcanic creek, to which a stampede was directed in 1901, and on which quite a number of claims were located, has seen no activity this year. Most of the locators, as is usually characteristic of stampeders, have allowed their claims to lapse.

A number of leases are held on Moose creek, which is situated at the south end of Atlin lake, and these have been prospected with encouraging results. I expect to see active operations undertaken on these during the coming season.

On Graham creek, Taku arm, considerable activity existed in 1900, but last year none appear to have met with encouragement except the owners of *Discovery* claim. This season, again, the creek was practically left to the owners of the *Discovery* claim, who worked for a part of the year, with very fair results.

Mineral Claims.

Beavis Group. The *Beavis Group*, comprising the *Gold*, *Gold No. 2*, and *Sydney Fraction* mineral claims, is situated on the shore of Atlin lake about one mile north-west from the townsite of Atlin, and has lately been bonded for $10,000 to Mr. Henry Maluin, manager of the Société Miniere de la Colombie Britannique. Considerable work has been done on the property. On the *Sydney Fraction* an incline shaft

has been sunk 50 feet, and very fine free-milling quartz encountered, showing gold freely to the naked eye. On the *Gold* a shaft 30 feet deep is also in quartz showing free gold. On the *Gold No. 2* a shaft 9 feet deep looks equally promising, and in every shaft the quartz has shown free gold from the croppings down, improving with depth obtained. A Crown grant has been applied for, and it is the intention of the bonders to prosecute development with vigor.

On the *McDonald Group*, comprising six copper claims on Indian creek, 125 feet of tunnel (6 feet by 4 feet) have been run and the assays are quite satisfactory. The amount expended was about $3,500. A good trail runs from this property to Atlin lake and to the town of Atlin, and work will be maintained extensively during the winter, with a view to shipping to the Tacoma smelter as soon as navigation opens.

Rock of Ages.

The *Rock of Ages* mineral claim, Pine creek, is located in the bed of the stream and considerable difficulty has thus been experienced in development operations, owing to the great influx of water. With the aid of a small steam hoist and duplex pump, a shaft has been sunk 60 feet. From the bottom of this a cross-cut was run 7 feet and struck the hanging-wall of the ledge. A drift was run down-stream 60 feet at this level, and one 30 feet up-stream on the 30-foot level. The ledge, wherever tapped, is about 14 feet in width, mostly low-grade ore, although many extremely rich patches are encountered. A general sample of 3½ tons was shipped to Vancouver, and yielded in gold $49.97 per ton. Owing to litigation, scarcity of labour, etc., work has been much retarded hitherto.

The *Yellow Jacket* mineral claim, Pine creek, was discovered in 1899 by placer miners working in the bed of the stream, and very rich specimens were obtained. The Nimrod Syndicate sank 45 feet on the ledge, but the work was stopped by legal complications. This present season Mr. Ruffner and associates have run a 100-foot cut in the serpentine formation and have found low values in free gold. Samples from the ledge itself have been sent to the Coast for assay, but returns have not yet come to hand. The proprietors intend doing considerable work on the property during the ensuing season.

Imperial Group.

Work was commenced on the *Imperial Group*, Monroe mountain, on February 1st, 1902, and has been continued without intermission up to date. During the summer considerable development has been done on the surface and the outcrops exploited for several hundred feet. In these new workings the vein shows strongly, and good values are obtained over the whole development area. The vein maintains an average thickness of about 4 feet, compact, strong and well-defined, with clean smooth walls, and yielding an average value of $20 per ton of ore. A series of small crushings have been treated in the local mill, giving a return of $12.40 to the ton. It has been demonstrated that the local mill does not extract more than 40 per cent. of the gold values, as test shipments of exactly the same ore as that treated locally have given a return of over $26 to the ton. Development work is now being carried on at the 100-foot and 200-foot levels. Rich ore is being raised, there are now about 100 tons ready for treatment. It is the intention of the management to install a new and complete crushing plant in the spring, which will be adapted to this class of ore.

On the *British America Group*, Slate mountain, Little Spruce creek, besides assessments, further work has been done in the tunnel of the *Gold King*. In a cross-cut in the *Ivy May* some very rich ore was exposed, but the country being much broken up, a tunnel has been started to tap the lode at a depth of 150 feet. Assays from the several workings have run from $12 to $840 per ton. A Crown grant will be applied for in due course, and it is the intention of the owners to push work in the spring,

On the *Laverdiere* and *Caplice Groups* of copper claims, situated at the south end of Atlin lake, development work was steadily prosecuted last winter, with good results, but, owing to some misunderstanding, the bond under which the work was done was not taken up. Crown grants are being applied for for six claims.

On the *Lake View*, situated between Boulder and Ruby creeks, active development has been in progress during the season, but I am not in possession of statistics from which I can report progress.

Engineer Group.

On the *Engineer Group*, Taku arm, some development work was done during last winter, and a triple discharge Hendy stamp-mill complete is now being installed on the property, at an estimated cost of $15,000. The mill is expected to be in position and ready for work by February 1st, 1903, and as soon as warm weather sets in it is expected to open up on the ore-body and start crushing.

On the *Gleaner Group*, Taku arm, owned by Dr. P. F. Scharschmidt and associates, active development was prosecuted last winter, but nothing is doing at present, I believe, and I have not been furnished with such particulars as will enable me to report progress.

The *White Moose Group*, Taku arm, has undergone extensive development. It has recently changed hands and is now owned and is being developed by a local syndicate. The property is said to give promise of proving very valuable.

Nothing has been done upon the *Anaconda Group*, adjoining Atlin townsite, nor on the *Big Canyon Group*, on Fourth of July Creek, since the last report. There are a large number of claims throughout the Atlin Division alone on which only the necessary assessment work to keep them in good standing has been performed, and some of these are very promising properties indeed. There have been quite a number of new locations recorded during the year, and some of the new discoveries indicate high values on the surface. Good ledges have been discovered near the heads of Boulder and Ruby creeks, and altogether the indications justifying the expectation of the ultimate development of important quartz mines in this District are being multiplied every season.

OFFICE STATISTICS—ATLIN DIVISION.

Records, 209, representing	213 claims.
Re-records, 519, "	665 "
Bills of sale, etc.	359
Grouping and representation, etc.	51
Permits, moving stakes, etc	18
Abandonments	47
Leaves of Absence	403
Orders issued by the Gold Commissioner under Part IV. of "Placer Mining Act"	6
Bedrock flume permits	1
Free miners' certificates issued	770
Company free miners' certificates issued	6
Hydraulic leases issued	9
" " applied for	99
" " cancelled	87
Water records issued	8
" applied for	21
" abandoned	1
" cancelled	9
" in force	62
Gold Commissioner's orders, injunctions, investigations, under Part IX.	58

Mineral records issued	174
Certificates of work issued	170
Notices filed (mineral)	59
Bills of sale (mineral) recorded	62
Certificates of improvement issued	12

Revenue Collected.

Free miners' certificates, individual			$ 3,731 25
" company			600 00
Mining receipts, lease rentals	$8,885 00		
" water rentals	1,163 90		
" bedrock flumes	227 50		
" other sources	5,344 80		
		15,621 20	
Mineral tax (royalty)	5,239 70		
Less amount refunded	1,149 35		
		4,090 35	
		24,042 80	
Total revenue of Atlin Office			$33,707 52

Royalty Paid.

Creek.	Individual Miners.			Hydraulic Companies.		
	Ounces.	Value.	Royalty.	Ounces.	Value.	Royalty.
Pine	2,822	$43,724 00	$ 874 48	1,195	$18,522 00	$ 370 44
Spruce	4,064	65,024 50	1,300 49	125	2,005 00	40 10
Boulder	4,480	69,444 50	1,388 89	1,550	24,000 00	480 00
Wright	387	6,002 50	120 05	.....	.....	.....
McKee	364	5,814 50	116 29	1,500	24,000 00	480 00
Otter	.....	.....	.....	170	2,635 00	52 70
Graham	42	642 50	12 85	.....	.....	.....
	12,159	190,652 50	3,813 05	4,540	71,162 00	1,423 24

Summary.

	Ounces.	Amount.	Royalty Paid.
Individual	12,159	$190,652 50	$3,813 05
Hydraulic companies	4,540	71,162 00	1,423 24
Quartz	.....	170 50	3 41
	16,699	261,985 00	5,239 70

BENNETT LAKE MINING DIVISION.

Big Horn Group. Big Horn river.

Very little progress has been made during the year on the different mineral locations beyond the necessary assessment work, with the exception of the *Big Horn Group* and the *Emerald No. 2*, lying in the vicinity of the The owners of these claims, Messrs. Olsen, West, Bashart and Lundberg,

MOSS SWAMP OVERLYING COAL MEASURES, QUEEN CHARLOTTE ISLANDS.

LOWER SANDSTONE OVERLYING AGGLOMERATES-SKIDEGATE INLET.

have had a great deal to contend with because of the poor facilities for getting ore to the point of shipment. However, during the past summer they built a good waggon road, nearly 7½ miles in length, erected a wharf and warehouse, and this winter they purpose hauling out several tons of ore which they have ready.

Development work was performed on the *Emerald No. 2* to the extent of one tunnel 45 feet long, and another 22 feet long, each 5 feet by 6½ feet. An aerial tramway from the mine, 1,700 feet long, with one stationary wire and double return, has been built, as well as a very good dwelling house, 18 feet by 26 feet, and out-buildings. During the autumn, 6¾ tons of ore were shipped to the Tacoma smelter, and realised $75 gross per ton, while there is a large quantity of ore on the dump.

Office Statistics.

Free miners' certificates issued, individual	57
" " special	1
Mineral claims recorded	41
Certificates of work issued	23
Payments made in lieu of work	1
Bills of sale, etc., recorded	19
Notices of grouping filed	3
Permission to re-locate granted	1

Revenue Collected.

Free miners' certificates	$270 25
Mining receipts	770 75
Miscellaneous	227 25
	1,318 25

CHILKAT MINING DIVISION.

Since my last report there has been an increase in the mineral locations, but I regret to say that placer mining has fallen off considerably, and of the hundreds of claims staked in the fall of 1900 but few remain in good standing.

Placer Mining.

Very few miners have come in to Bear and Clear creeks this season, nearly all of the claims having been abandoned, owing to the discouraging prospects for working the creeks to any advantage by individual miners, the difficulty of controlling high water, depth to bedrock and interference by quicksand. There are still a few miners on the creeks who continue to persevere, and the fact of their remaining till this time of the year goes far to show that good pay may be struck. Should their hopes be realised placer mining may revive, and we may reasonably look forward to a return of most of the miners who staked at the time of the *Discovery* in 1900. Later on in the year I may be in a position to furnish further information as to the results of the work in progress at the present time.

Mineral Claims.

Assessment work has been done on 73 mineral claims in the Rainy Hollow district and on Boulder creek during the year and 14 new claims recorded. The *Soldiers Three*, *Custer* and *Ivanhoe* are in the most advanced stage of development and make a very fair showing, and their owners seem to have every confidence in them. New and apparently promising locations have been made near the mouth of Boulder creek, a tributary of the Klehini river, and about

11 miles from Wells. On Rant mountain, one of the range running parallel and adjacent to the Chilkat river and about two miles from Wells, eight claims have now been staked and recorded, and payment has been made in lieu of work on four of them this year. Several properties in the Rainy Hollow district were bonded during last winter and a considerable development is expected during the coming year. The claims on Rant mountain show an immense vein of magnetic iron ore carrying over 50 % of iron according to reported assay. Four of the claims have been taken over by a Mr. Palmer, of Seattle, who intends forming a company for their development. On the whole, progress is satisfactory, and with more advantageous means of transport the cost of working will be materially reduced and development of the mines in this District accelerated.

Trails.

A considerable amount of work has been done on the Rainy Hollow and Bear Creek trails during the current year, whereby they have been improved and shortened. The variation of the channel of the Klehini river during high water affects the former to such an extent that a considerable amount of corduroy is still required, in order to make it possible to travel over it dry shod during the summer months. As these trails are across the Chilkat river from Wells, a bridge is a necessity, and at present all travelling by these trails are taken over in the Government canoe by the constable here. I may also state that the Rainy Hollow trail is used to a great extent by residents and miners of Porcupine City. The development and value of the mines in the future will determine the question as to the necessity of waggon roads, etc., but the collections this year do not seem to justify any abnormal expenditure at present.

With reference to those claims, both mineral and placer, in that part of the district placed under our jurisdiction by *modus vivendi* of 20th October, 1899, assessment work under United States regulations has been done on some of the claims on Glacier creek, but nothing with regard to them has been recorded at this office to date.

OFFICE STATISTICS.

Records of mineral claims issued	14
Records of placer claims issued	5
Placer claims re-recorded	1
Certificates of work issued	73
Leave of absence granted	2
Free miners' certificates issued	71
Grouping and representation permits granted	10
Mineral bills of sale recorded	14
Placer bills of sale recorded	3

Revenue Collected.

Free miners' certificates issued	$ 315 75
Mining receipts	683 60
	$ 999 35

NORTHERN PORTION OF CASSIAR DISTRICT.

(INCLUDING TESLIN, LIARD AND STIKINE MINING DIVISIONS.)

Under date of the 20th October, 1902, the Gold Commissioner of the District, Mr. James Porter, reports as follows:—

During the past season six creek and five hydraulic leases have been granted, and there is another application in for a hydraulic lease on Dease creek. Nine of the leases granted are

on Rosella creek, in Liard Mining Division, and two are on the First North Fork of Clearwater river in the Stikine Division. Other than this, nothing of any apparent worth has been recorded.

Rosella Creek.

The Rosella creek property is in the hands of certain residents of Victoria. It has from early days been thought that the creek is rich in gold, and that it would certainly pay if worked in a proper manner. This will require some capital, as it will be necessary to operate on a large scale, and the remoteness of the district will render the transportation of the machinery, etc., though perfectly feasible, a matter of considerable expense. Once, however, the value of the ground for hydraulicing is recognised the prospects of the locality seem bright.

The First North Fork of Clearwater river has attracted some attention during the season, and several placer claims have been recorded and gold taken out. The gravel does not prove to be rich, though the interested parties think it sufficiently so to pay if it is worked on a different plan to the ordinary method of shovelling into sluice-boxes, and they have therefore secured leases covering the ground.

Thibert Creek Mining Co.

A very unfortunate accident occurred to this company, the workings being completely buried by a large landslide. Luckily this occurred in the night, when only two men were in the mine, and these escaped unhurt. Prior to the slide everything was looking favourable for a big clean-up this fall (1902), but owing to three out of the four monitors being buried, the greater part of the employees had to be dismissed, the remainder being kept on to clear out the works in readiness for the coming spring. Mr. Hamfield, who was formerly manager of the property, but who has now himself leased it from the company for a term of years, informed me that though the slide had caused a serious drawback to the season's operations, yet no serious damage had been done, and that, practically speaking, it had left the pay gravel uncovered.

Note by Provincial Mineralogist.—The following account of the working of this company during the year 1902 has been extracted from the admirable report of the manager, Mr. Alexander Hamfield:—

The property of the company consists of 7 hydraulic mining leases of 80 acres each, consolidated, and having a total frontage on Thibert creek of 10,500 feet. After deciding last spring to install 2 new No. 4 monitors, 2 new 12-inch water-gates, and 600 additional feet of 12-inch pipe, no time was lost in forwarding this apparatus, and on the 25th June rivetting the new pipe had so far progressed that washing could be begun.

It was noted last year that the block of ground between Nos. 1 and 2 pits gave some trouble by slipping, and, notwithstanding the precautions taken, the whole of this deposit, containing thousands of tons of boulder clay and mud, slipped into the mine, filled the pits mentioned and covered 3 monitors, 2 gate valves and 100 feet of pipe, besides taking out the 3 lower sluice-boxes in No. 2 pit. Though this accident was unfortunate in delaying operations, it has effectually disposed of the most difficult ground to be mined. The débris has now been removed, machinery and pipe fixed up and boxes re-set. The machinery was luckily not destroyed, and everything is in readiness for operations next spring. Two new pits, with rock cuts and the necessary sluice-boxes, were opened up during the year, and 2 monitors are now placed so that a fifth pit can be easily begun, thus making five different openings from which to wash gravel.

After two years' trial the undercurrents have been taken out, as they show only 1 % of the recovery from the sluices, and this will not pay for making them or keeping them running.

It is safe to say that the first two boxes (21 feet) gave 85 % to 90 % of the total gold recovered in the sluices, and this is due to an exceptionally good and heavy quality of gold which is easy to save. Although in hydraulic mining this is a very great advantage, this same quality of gold has, on the other hand, a tendency to "rob the sluices," so that a very large percentage settles in the rock-cuts and in all the crevices on bedrock and is not recovered till the latter is "picked up" and cleaned. The flume, which caused trouble last year by settling and consequent leakage, has now found a solid and permanent foundation.

From the work done during the season the value of the bottom between Nos. 1 and 2 pits is demonstrated, and as good gravels have also been found in pit 3, it proves that the rich paystreak continues all down the channel. The width of the channel has been shown to be much greater than was expected, and this increased width has given an increased height of bank to wash.

After two years' prospecting, it is shown that the value of the gravels is from 12 to 25 cents per cubic yard, and the management is entirely satisfied with the results of operations and the future possibilities of the mine.

The work done during the year is summarised as follows:—

Two new large monitors, two water gates, and 600 feet additional pipe have been brought into the mine and installed. Two new pits have been opened, making four now ready from which to take gravel, and a monitor placed so that a fifth can be readily started. Cuts made and sluice-boxes set. Flume refixed so that it will now run water continuously without having to stop for repairs. Rich paystreak in the bottom gravels proved to be continuous wherever the channel has been opened. Some of the top gravels as high as 80 to 120 feet above bedrock run off and shown to pay for taking down, and a great deal of bottom gravel made ready for taking out. It has been shown that gravel of a low grade, if economically washed, can be mined here at a good profit. The report deals in detail with questions of water supply and points out the importance of this factor in regulating the output of gold.

Mr. Hamfield left with the Provincial Mineralogist a small sample of the platinum sand which he had collected from the undercurrents, and from the black sands in the sluice boxes. This sample was, of course, a concentrate, and it was analysed by the Provincial Assayer, Mr. Carmichael, who reports as follows:—

No. 2,923—Concentrates from Thibert creek, Cassiar:

Platinum =	12,864.5 oz. troy	per ton	= 44.1 %
Osmiridium =	3,475.5 "	"	= 11.9 %
Total.....	16,340 "	"	= 56.0 %

Little or none of this sand is saved, which seems a pity, considering its great value.

A company of Scotchmen has been engaged during the past three summers trying to bottom deep ground on Little Deloire creek, which is a tributary of Thibert creek. So far they have not been successful, but they have faith in the ground and intend to try it again next season.

Nothing other than the usual amount of assessment work necessary to hold them has been done on any of the mineral claims in this District during the season, and there has been only one new location recorded.

As near as I have been able to ascertain, the output of gold for the season does not exceed $16,000. This includes all divisions in the District. I hope and expect to see a marked improvement in mining activity in the District before a corresponding date next year.

SKEENA RIVER MINING DIVISION.*

(A Division of Cassiar District under the jurisdiction of the Victoria Gold Commissioner.)

Report by Jno. Flewin, Mining Recorder.

I have the honour to submit herewith my report on mining matters in the Skeena Mining Division during the year 1902:—

A large amount of money has been expended in development work in this Division on properties located in 1901 and previous years, principally on Princess Royal island, Gribbell island, Ecstall river and Observatory inlet. Capital is becoming gradually interested in these camps, and in the event of a deal now under negotiation being consummated, development work on a large scale will be inaugurated early in 1903. The great difficulty under which properties in this section have laboured heretofore has been a want of capital to carry on work on a sufficiently large scale to ensure profitable returns. Two principal reasons seem to have deterred capitalists from investing here; the first being the high price asked by prospectors for their holdings, and the other being the idea, widely prevalent, that the Northern Coast of British Columbia is locked up with ice and snow during the greater part of the year, with a consequent very short working season. This is a very great mistake. With the exception of a few days in mid-winter, there is not any portion of the Dominion, or Northern and Eastern United States, where a longer working season obtains. The snowfall at Port Simpson, which is the most northerly point on the coast of British Columbia, is much less than at Vancouver, the register for last winter, which was an average one, being 14 inches. Mr. J. H. Rodgers, who spent the winter of 1901-02 at the Bonanza mine, on Observatory inlet, and who had a gang of miners working continuously, informs me that there was only one day from January 1st till July 23rd (the date on which I saw him) on which his men could not work out of doors, and that was on the occasion of a heavy snowstorm in March.

A large amount of mining business has been transacted during the year and a greater number of prospectors have been out than ever before.

Miners in the Kitamaat, Kitsilas and Telkwa camps are still hoping for the building of the Kitamaat-Hazelton railway, which will give access to the rich mineral belt of the Coast and Kitsilas range of mountains, and the extensive agricultural, grazing and hydraulic areas of the Upper Skeena, the Bulkley and the Omineca. At the present time, however, lack of transportation facilities is an effectual bar to extensive development work. Several promising-looking strikes were made by prospectors during the season between Kitamaat arm and Skeena river. The only other new strikes reported in the Division this season were made on Portland canal, where a number of very fine-looking copper-gold and galena ledges have been located, which seem from the returns to promise a fairly high-grade copper camp. The assays show gold values ranging from 50 cents to $22 per ton and from 2 to 20 % copper.

Only one property has, as yet, shipped from the District, this being the *Princess Royal Group*, on Princess Royal island, Mr. Jas. Findlay, manager, which sent out 100 tons, netting about $120 per ton.

Observatory Inlet.

Bonanza Group. On this property, bonded to M. K. Rodgers, upwards of $20,000 have been expended, 800 feet of tunnel having been run, and houses, blacksmith shop, etc., constructed. In July the crew were transferred from thence to the *Manson Group* of mineral claims on Hidden creek, about three miles distant, on which Mr. Rodgers had a short time previously secured a working bond.

*See also Dr. Marshall's report on certain properties in this division, p. 49.

The *Manson Group* consists of the *Manson*, *McKinley*, *Donald*, *Rudge*, *Alpha*, *Gama*, *Carolina* and *Kenneth* mineral claims. On these claims continuous work was prosecuted from July until November, when Mr. Rodgers decided to lay off his men until the spring, as his houses were not finished and he required machinery to prosecute further work. Two hundred feet of tunnel have been run at different parts of the ledge. The ore is chalcopyrite, the copper values running from 8 to 15 %, with a small gold value.

On the *Martha* and *Edith* claims, belonging to Messrs. Blumel & Hudson, and the *Beta*, the property of Messrs. Collison & McCullagh, all of which claims adjoin the former group, the usual amount of assessment work has been recorded.

Messrs. Robertson & Stark cut out a good trail to the *Castle Group* at Mount Clashman, and did considerable stripping and surface prospecting. The same parties also cut a trail to the *Sarah Group*, lying between Fall and Hidden creeks.

Portland Canal.

On this inlet a number of locations were made during the year. At Maple bay, W. R. Flewin located a very promising-looking ledge, showing assay values of from 2 to 15 % copper and running as high as $30 in gold. The formation is diorite, capped in places with volcanic breccia and intersected at frequent intervals with large porphyry dykes. Some fine samples of carbonates of copper and lead and copper glance have been taken from this ledge. Shortly after the first discovery, Messrs. Collison & Noble made several more locations near the same point, and a house has been built by them, trails cut and a small amount of surface prospecting and open cutting done.

During the season a very rich strike was made about 20 miles from the head of the Canal, near American river, by Messrs. Stewart & Brightwell, showing a large body of ore. Some of the assays give 600 oz. in silver, while several show $80 in gold, silver and copper. Messrs. J. E. Stark, D. J. Rainey, J. Stewart and G. Chambers also located some galena and copper properties at different points on the Canal. All the assays from this camp show a gold value. In all, 41 claims were recorded in this section for the year.

Kitsilas Camp.

Ptarmigan Group.

The owners of this group, realising that nothing more can be done to develop these claims without better transportation facilities, only employed a small gang of men during the season. Work was shut down in September, and a shipment of five tons of ore was made to test the property. The owners have applied for Crown grants for this group.

The owners of the *Hickey Group*, lying near the *Ptarmigan*, have also applied for Crown grants.

Statutory assessment work has also been performed on the *Washington*, *Northland*, *Toulon*, *Bull-Dog*, *Montezuma*, *Eureka*, *Hatzic*, *Golden Crown*, *Ruby*, *Granite*, *Golden King*, *Goldfinch*, *Golden Eagle*, *Golden Crown Extension*, *Strathcona*, *Helma* and *Monte Cristo*. I do not anticipate that any extensive development work will be prosecuted on any of these properties, some of which look exceedingly promising, until railroad communication with the Coast becomes an accomplished fact. The Skeena river is, at best, a very uncertain highway, owing to the sudden rise and fall of the waters; added to which the freight rates are so high as to effectually deter anyone from attempting to take in the supplies and machinery necessary for conducting mining operations on a large scale.

ECSTALL RIVER.

Bell-Helen Group.

In addition to driving a large amount of tunnels on this property, the owners have constructed and equipped a gravity tramway from the mine to the river, and are almost ready to ship ore. The property was inspected late in the season by the representatives of an English company, who are now negotiating to purchase the same.

TELKWA RIVER.

In this camp only the usual assessment work has been performed on the *Forrest Group*, the *Big Blue*, *Surprise* and *Constance* mineral claims. The same difficulty—want of communication—is experienced here as at Kitsilas.

LORNE CREEK.

The past season has witnessed considerable activity in this old placer camp, the owners of the *Dry Hill* claim having put in a large dam on Lorne creek itself, giving them ample storage of water, with a 32-foot head. They have also erected a substantial flume between the dam and the mine. After this work was completed they had a short run, with a very gratifying wash-up. Mr. F. E. Holt, the manager, deserves great credit for the large amount of work which he and his associates have accomplished under great difficulties. They are now well equipped for the coming season's work, and are confident of a handsome return.

On the *Hardscrabble* (placer), W. J. Pascoe & Co. have done considerable work, putting the claim in shape for active mining next season. They have also secured from the Provincial Government a hydraulic lease of the adjoining abandoned ground for twenty-one years. Several new placer records were also made on this creek, on all of which more or less sinking was done.

KITAMAAT ARM.

Golden Crown Group.

Messrs. Steele & Dunn have worked continuously the whole season on this property. A large amount of stripping was done and the main tunnel driven 25 feet. The ledge is looking well and values continue to improve with depth. This property should soon be in a position to ship. On the *Porcupine* and *Paragon* mineral claims, having the same owners, the usual amount of assessment work has been performed.

Prospectors are gradually extending operations up the Kitamaat valley towards Skeena, and 16 new locations have been made at different points, some of them on very large bodies of ore.

GRIBBELL ISLAND.

Empress Group.

This group is owned by the Canadian-American Mining Company, of Whatcom. The company has had a large gang of men continuously at work during the whole season, and has recently made a strike of very good ore in the main tunnel. It is contemplated putting in a tramway and bunkers early in the spring, in order to ship, and arrangements are being made with that end in view.

Copper Cliff Group.

On this group, also, the owners have been continuously at work all the season, driving the main tunnel in to tap the ledge. In addition to this work a large amount of surface prospecting has been done. The property is owned by the Gribbell Island Copper Company, of Fairhaven, Wash.

PRINCESS ROYAL ISLAND.

Princess Royal Group.

Mr. Jas. Findlay, the manager of this group of claims, has shipped 100 tons of ore this year under his bond, and the shipment netted an average, I am informed, of about $120 per ton. This property and also the various claims on the island owned by Messrs. Kelly and Cleveland have been inspected by the agents of and are now under bond to an English company.

Nothing has been done this season on the adjoining property, the *Homestake*, owing to the lawsuit which has been pending all the season with the owners of the *Princess Royal Group*.

On the *St. Patrick Group*, consisting of the *St. Patrick*, *Bay View* and *Teddy* mineral claims, the owners have run one open cut, driven one tunnel, and sunk one inclined shaft, expending $1,000.

On the *War Eagle* and *Cornell* claims, owned by Messrs. W. B. Morse, W. E. Hay and B. McConkey, a cabin has been built, shaft sunk, and two cross-cuts run on the ledge.

QUEEN CHARLOTTE ISLANDS.*

Seven new locations have been made on Moresby and Copper islands during the year, the last one being a re-location by Mr. David Yule, of the old Hudson Bay Company's free-gold claim on Mitchell harbour. This claim was famous in the early 50's as a gold producer, the H. B. Co. having taken a number of miners there on the old steamer "Beaver." A considerable amount of the precious metal is said to have been extracted by them, but, from the primitive methods employed, as much was blown into the bay as was saved, great masses of ore having been scattered in all directions, some even landing on the decks of the historic old steamer, then lying at anchor near by. The stringers of ore were followed where they showed large quantities of gold, but, when values became small, were abandoned. Mr. Yule has recently returned to the island, equipped to thoroughly prospect the property.

On the *Golden Gate* (Skincuttle entrance) and *Trust* mineral claims the owner, Mr. A. Heino, has run a 20-foot cross-cut and sunk two shafts, expending over $1,000 on the same.

Mr. Jas. Raper has performed the following work on his claims on the islands:—On the *Skincuttle*, sunk one 4 by 8-foot shaft 22 feet; run one cross-cut tunnel 4 by 6 by 10 feet long; one open cut 36 feet, an average of 4 feet deep; 100 feet of trenching in soil, 2 feet deep and 2½ feet wide; trail cut half a mile in length. On the *Poole* mineral claim, sunk one shaft 30 feet deep, 4 by 8 feet; run one cross-cut tunnel 18 feet long and 4 by 6 feet; 4 open cuts, mostly in rock, 2½ feet deep by 3 feet wide, average 18 feet in length each, and made one trail 800 feet long. On the *Margaret* mineral claim run one open cut 20 feet long, 5 feet deep at end, all in rock, and 30 feet of rock trenching done.

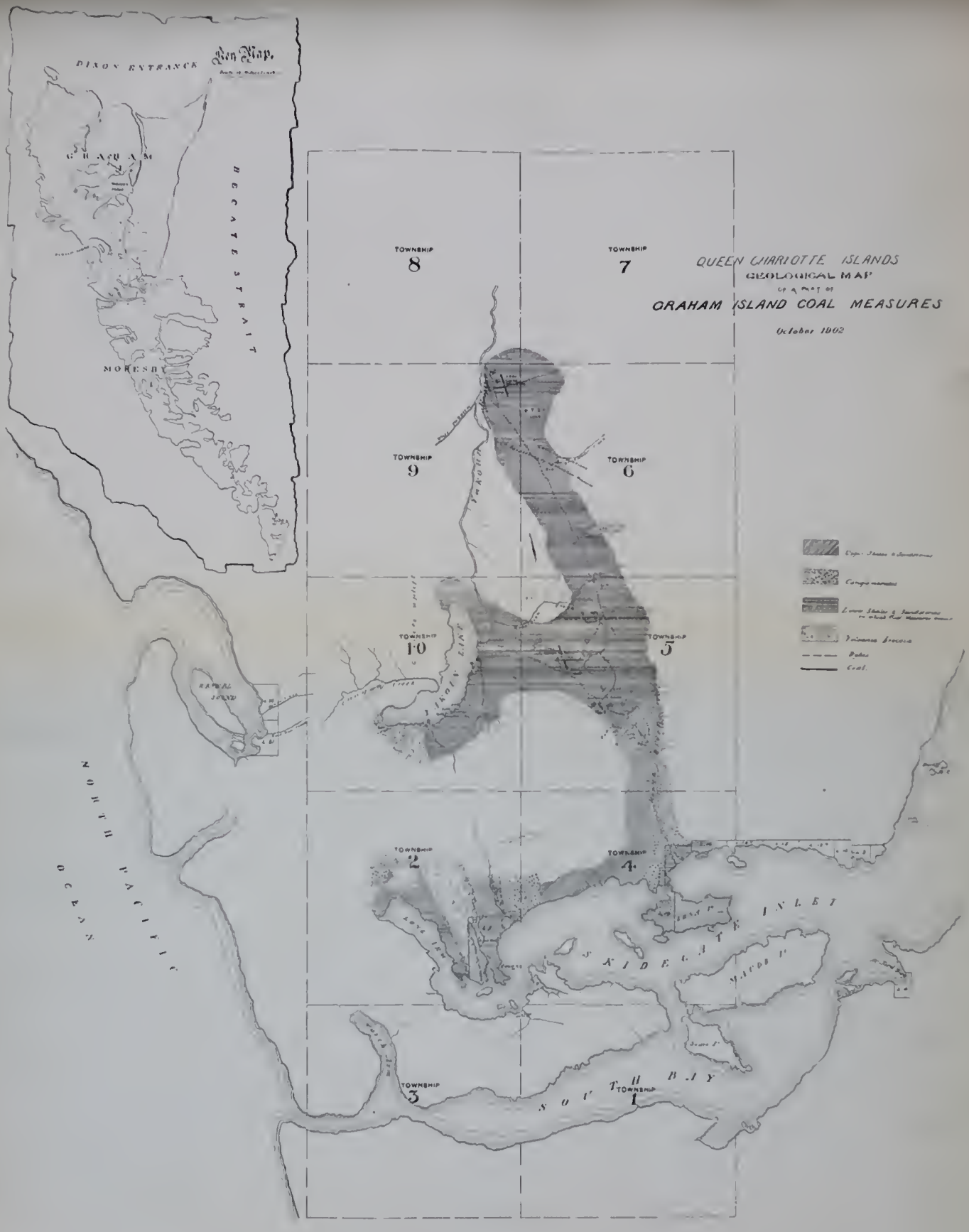
OFFICE STATISTICS—SKEENA MINING DIVISION.

Number of free miners' certificates	146
" mining claims recorded	164
" certificates of work	173
" conveyances	82
" certificates of improvements	23

Revenue Collected.

Free miners' certificates	$ 666 00
Other mining sources	1,095 25
Total	$1,761 25

* *See* also Dr. Marshall's report on the coal deposits of these Islands, which follows.

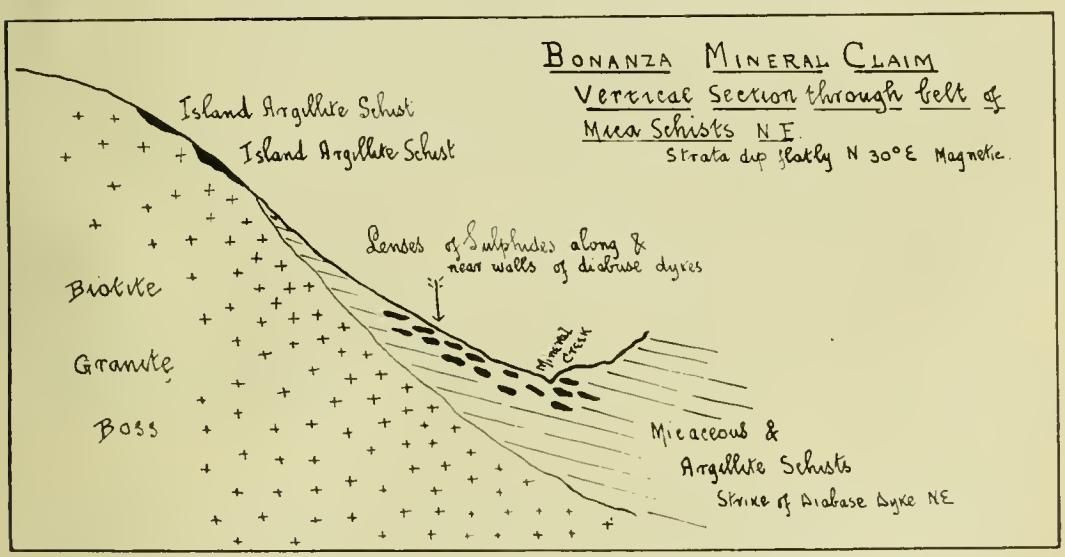

Key Map.
DIXON ENTRANCE
GRAHAM
MORESBY
HECATE STRAIT
TOWNSHIP 8
TOWNSHIP 7
TOWNSHIP 9
TOWNSHIP 6
TOWNSHIP 10
TOWNSHIP 5
TOWNSHIP 2
TOWNSHIP 4
TOWNSHIP 3
TOWNSHIP 1
QUEEN CHARLOTTE ISLANDS
GEOLOGICAL MAP
OF A PART OF
GRAHAM ISLAND COAL MEASURES
October 1902
NORTH PACIFIC OCEAN
SKIDEGATE INLET
NAIDEN I.
SOUTH BAY

NOTES BY DR. MARSHALL.

The following report on certain mineral claims in the Skeena Division and on the Coal Deposits of Graham island, Queen Charlotte group, is contributed by Dr. T. Rhymer Marshall, F. C. S., &c.:—

The Bonanza Group.

The *Bonanza Group* of mineral claims is situated on a small stream called Mineral creek, which flows into Goose bay, Observatory inlet. The group comprises the *North Star*, *Emma*, *Emerald*, *Bonanza* and *Princess Louise* (all Crown-granted mineral claims), as well as several extension claims, and is owned by the Bonanza Mining Company, of Port Simpson. The property was bonded to Mr. M. K. Rodgers, who, however, threw up the option last summer, after prospecting the ground by 800 feet of tunnels and upraises, as it was found that at inconsiderable depths the ore became of too low a grade. It was accordingly thought important to study the local



geology, in order to find out the reason why so promising a prospect, with rich and widespread outcroppings of copper, should yield, on prospecting, such disappointing results. The *Bonanza Group* lies near the base of a great granite mountain over 4,500 feet high, with the characteristic rounded top. Immediately above the 3,000-foot level, islands of argillitic schists lie on the bare granite. These are the remains of the sedimentaries which were carried up in the great mountain uplift. Below the 3,000-foot level the flanks of the granite boss are covered by an inconsiderable thickness of argillitic schists. On the property these schists dip flatly down the mountain side (N. 30° E. magnetic), and are traversed by a belt of mica schists. Spurs from the granite cut through the metamorphic sedimentaries in the form of pale granitic dykes, generally mineralised by molybdenite. (One dyke had a strike N. W. and dip of 45° S. W.) A later disturbance caused fracturing of the strata and the intrusion of a number of narrow parallel dykes of diabase, whose general strike is N. E. (magnetic). The evidence in the field is very strong that these basic dykes are of later origin than the granitic dykes, as the latter cross and fault the former. In the vicinity of the basic dykes the mica schist carries one to two per cent. of copper. At or near the contact of the dykes and close to the surface, lenses of associated chalcopyrite and pyrrhotite occur. Four of the richest lenses are about 4 feet thick at the belly, and contain from 6 to 8 per cent. of copper. The long axes of these lenses follow the dip of the strata, which is practically the same as the general slope of

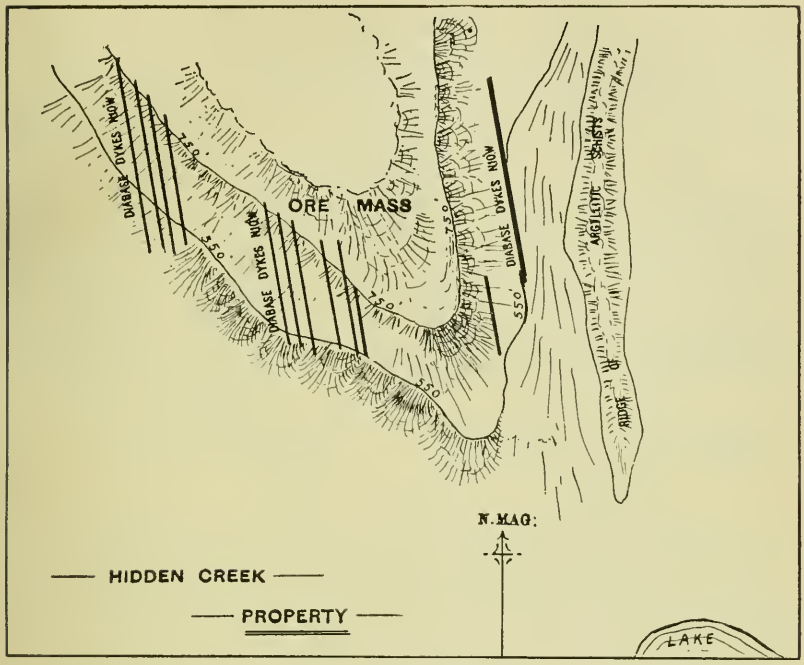
the hill and in the same direction. The lenses are found to lie in a very soft mica schist. The mineralised zone crosses Mineral creek and dips into the hill on the other side, where the mineral near the surface is chiefly secondary iron pyrites.

This property affords an interesting example of the phenomenon of secondary surface enrichment. The schists, which were evidently mineralised with minute quantities of sulphides of copper and iron, during the process of contact metamorphism, were disturbed at a later period with intrusions of basic igneous material in the form of dykes. Open channels were thus made in which "bonanzas" were formed by concentration of sulphide from the surrounding schists. Naturally, in such a rock as mica schist, these openings would only occur to a marked extent at or near the surface. Although the property does not give much promise of ore in depth, still a considerable amount of shipping ore could be secured at and near the surface and transported cheaply, owing to natural facilities of location.

A specimen, taken from a grayish white dyke exposed in the bed of Bonanza creek, near the foot of the ore dump, was sent to the Geological Survey Department at Ottawa, for microscopical examination. The following report was made by Dr. Barlow.—"The hand specimen represents a hard, compact rock of a light gray colour and porphyritic structure. Under the miscroscope the rock is seen to consist of phenocrysts of feldspar and biotite imbedded in a microcrystalline quartz-feldspar-calcite ground mass. The feldspar is a plagioclase, probably oligoclase. It is very turbid from alteration to kaolin, epidote and calcite, the former product largely predominating. The form, as a rule, is good, but varies from idiomorphic to very irregular and corroded ones. The biotite is present in relatively small amount, and occurs in irregular individuals and oblong forms. It is much altered either to chlorite or by leaching to a green and then coloured mica, which still retains the high double refraction. A few grains and cubes of pyrite, a grain or two of zinc and apatite complete the section. The rock is an *Andesite* and somewhat altered." Although the rock differs in character from the other granitic dykes, it is undoubtedly associated with the underlying biotite granite.

Hidden Creek Group.

The *Hidden Creek Group*, situated on Goose bay, Observatory inlet, includes the *Manson, Rudge, McKinley, Donald, Alpha, Beta, Gamma*, and *Caroline* mineral claims, owned by the Union Jack Co. The property has been bonded to M. K. Rodgers. Work on the outcrops has ceased for the present, but will be resumed in the spring, when a shaft will be sunk by contract work. The claims are situated on and around Red mountain, which lies 16 miles N. 30° W. from Hidden creek falls. These falls, which will in future prove of immense service as a source of cheap power, are close to the shore of Goose bay, but are separated from deep water by extended gravel flats. Red mountain stands out prominently in the landscape and presents one of those extraordinary examples of extensive rock replacements by silica and metallic sulphides. The mountain ridge has a direction N. 30° W., with an elevation about 700 feet. The above sketch, with the two contour lines of 550 and 750 feet elevation, gives some idea of the shape of the mountain. The mountain is intersected by a number of parallel dykes, more or less vertical and composed of diabase rock, their general strike being N. 10° W. (magnetic). These dykes have been intruded through the mountain mass after the mineralisation of the rock, but, nevertheless, they have played an important part by giving rise to conditions causing secondary concentration of the sulphides of iron and copper in rich lenses. The country rocks of the district are black argillitic schists, the schistosity of which is not so well marked as in those found near the mica schist belt on the *Bonanza* property. The granite underlies the schists on the Hidden creek property at considerable depth, and the nearest surface exposures are three miles distant from Red mountain, at Hastings arm. Red mountain marks the position

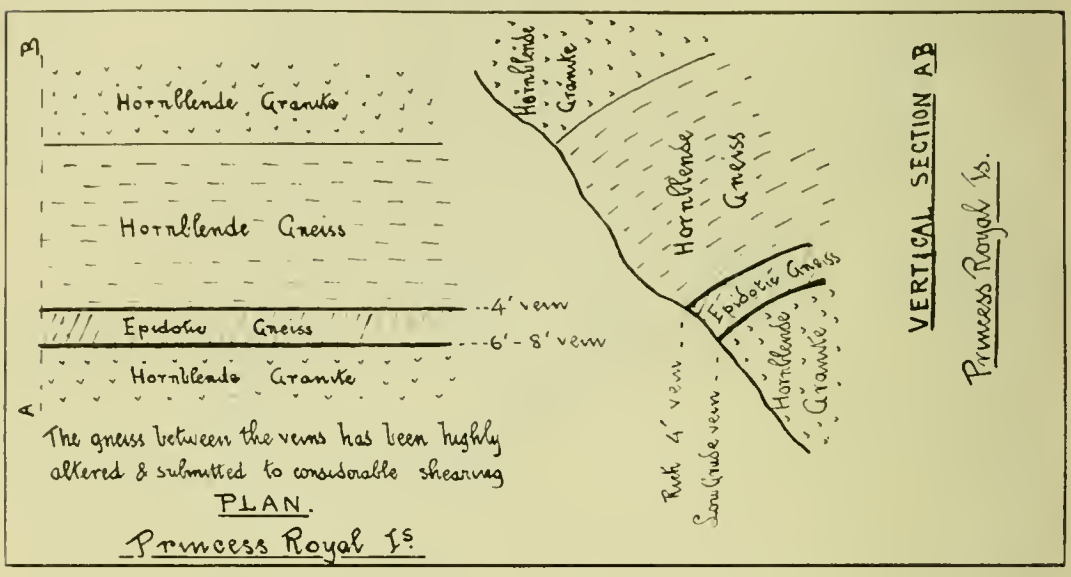


of a great fracture zone, the brecciated rocks of which have been subjected to intense alteration by mineral waters ascending from great depths. The ore mass has been traced for 900 feet along the crests and bluffs of the mountain. The ore is pyrrhotite and chalcopyrite, associated with a quartz gangue. Valuing the entire mass, the ore is very low grade, but in the vicinity of the dykes the lenses are fairly rich, assaying 6 % of copper on the average. As the amount of development work is very small (100 feet of tunnel work), it is impossible to say how far these enrichments extend into the mountain, but the indications are such as to warrant further development. The south-west side of the mountain slopes steeply to the valley below; near the top the ore is exposed, but the lower 400 feet are covered by detritus. The mountain drains into a small swampy lake which lies to the immediate south. The mud of the lake is rich ferric hydroxide, which has been formed by the weathering of the great ore mass above. The silicification of the rock of the Red mountain, however, has been the means of the escape of the mass from the effects of the general erosion of the district, which has proved a useful agent to man by carrying away the surrounding country rock, leaving the great ore core uncovered ready for mining, when means shall have been discovered for handling it at a profit.

Princess Royal Island.

Princess Royal island is now attracting attention, principally on account of the discovery of a couple of rich and well-defined fissure veins of quartz in the interior of the northern end. These veins are more or less parallel with a general strike of N. 8° W. (magnetic), and dip about

45° to the westward. The strike is parallel with the mountain upheaval, and work on the veins along the steep mountain side has proved, as would be expected, the dip to become more vertical with depth. About 15 claims have been staked along the outcrops, and good values have been obtained from the surface at many points widely apart.



The north end of Princess Royal island is composed of bold granite mountains, with characteristic rounded tops. The granite is coarsely crystalline, the large crystals of hornblende looking intensely black on the pure white ground of orthoclase feldspar and quartz. The two veins are associated with a broad strip of hornblende gneiss from one to two thousand feet wide, which lies in the granite and very possibly represents a remnant of a mass of metamorphosed sedimentaries, which in the final change were converted into hornblende granite. This gneiss belt runs north and south, and between it and the granite to the east lie the quartz veins, separated by a belt of schistose epidotic rock varying from 50 to 200 feet wide. Of the two veins, the smaller or west ledge is the richer and lies between the gneiss, which forms the hanging wall, and epidotic rock, which forms the foot wall. On the *Princess Royal Group* of mineral claims the average width of the vein is 4 feet, but the values are chiefly confined to the paystreak, which generally lies on the foot-wall, and is perhaps on the average 2 feet thick. It has never been less than 20 inches wide and occasionally has filled the entire vein The east, or large vein, has for its hanging wall the chloritic rock, with the granite as a foot-wall. The width of the ledge varies from 6 to 8 feet and even over, but the ore on the average is low grade, containing from $15 to $20 per ton, of gold, silver and copper. There is, however, some rich rock in the vein, as samples have assayed as high as $100 per ton. The values in both veins are chiefly in gold, and, up to the present, surface examination and exploration by rock work indicate permanency in values.

The principal route from the shore to the interior of the north end of Princess Royal island is from the head of Surf inlet, which is about 12 miles long and opens into Campania sound on the west side of the island. Any of the West Coast coasting steamers will land passengers, who have previously made arrangements at the office of the steamship, at the head of Surf inlet, where there is a floating wharf and small dwelling house belonging to Mr. Findlay. Three hundred yards from the head of this inlet lies Cougar lake, which is one of a

chain of three lakes draining a considerable area of land. The water from this natural system of reservoirs drains through a short stream terminating in a fall, over which a huge volume of water tumbles into the sea, a potential force of over 20,000 horse-power continuously running to waste. Stores for the mining camps are taken over a short tramway about 300 yards long, from Surf inlet to Cougar lake, then carried by boat to the head of the lake; thence by portage over a good trail for 2½ miles to Deer lake; thence by boat to the one-mile trail which terminates at Mr. Findlay's camp. The total distance is over six miles. The cost of transporting ore over this route at present is $8 per ton.

The veins have been explored most thoroughly on the *Princess Royal Group*, which comprises the *Princess Royal*, *Sadie* and *Excelsior* mineral claims. These claims have been surveyed and represent a total area of 120 acres. The owners are Capt. John Irving and Messrs. Wilson and Rithet, of Victoria, who have bonded their properties to Mr. J. Findlay and others, of St. John, N. B. The Tharsis Co., of Glasgow, Scotland, held the property for a short time this summer on a working bond from Mr. J. Findlay *et al.*, but such bond has now lapsed and Findlay & Co. are at present pushing development work as fast as possible. The following few shipments from the *Princess Royal Group* will give an excellent idea of the class of ore obtainable from the west or smaller vein (4 feet):—

(1.) Shipment of 20 tons of ore made on 10th of July, 1902.

Assay from average sample:—

5.20 ozs. of gold per ton.
1.50 " silver "
3.77 per cent of copper.

This shipment netted $95.83 less $11 transportation charges, per ton. The cost of transportation from the mine to head of Surf inlet was $8 per ton and $3 from there to the smelter. The smelter made a treatment charge of $5 per ton and allowed for gold $20 per oz., less 5%; for silver 52½c. per oz., less 5%; and for copper 11⅜c. per pound, less 5%.

(2.) On the 15th of September, 1902, two parcels of ore were shipped from the same vein.

(*a.*) 27,900 lbs. which assayed:—

6.4 ozs. of gold per ton.
3.7 per cent. of copper.

(*b.*) 6,700 lbs. representing run of ore in vein, which assayed:—

4.8 ozs. of gold per ton.
2.1 " silver, "
2.08 per cent of copper.

This yielded $93.20 per ton, less transportation charges. Still later shipments of 10 and 16 tons have netted $110 and $123 respectively.

There are many other claims in the District staked on and near the veins, but the amount of development work on these properties is but small. Good values, however, have been obtained at and near the surface at many points.

Messrs. Kelly and Cleveland own seven claims adjoining the *Princess Royal Group*. The *Homestake*, *Anaconda*, *Bonanza*, *Turner*, *Fraction* and *Summit* are owned by Messrs. Cliff, Howden, McMillan and others. This is an excellent mining camp and will be the scene of busy operations in the future, as the ore is rich and can bear the heavy mining and transportation charges.

REPORT ON THE COAL AND IRON DEPOSITS ON GRAHAM ISLAND, ONE OF THE QUEEN CHARLOTTE GROUP.

By Dr. T. R. Marshall, F. C. S., etc.

I arrived at Skidegate, Graham island, on October 8th, 1902. Graham island is the largest and most northerly island of the Queen Charlotte group, and is separated from Moresby island on the south by a narrow and tortuous channel, called Skidegate channel, which widens out to the eastward, where it is known as Skidegate inlet. On the north shore of this inlet lies the important Indian village of Skidegate, where the traveller may find accommodation and supplies, and which is the best starting point for all parts of the islands. Skidegate is easily reached from Victoria or Vancouver, as it is the last port of call, once a month, for the coasting steamer of the Canadian Pacific Navigation Company. The trip is interesting, as the route is almost entirely in inland waters and through beautiful scenery.

The most convenient way to reach any desired point in the Queen Charlotte islands is to hire Indians at Skidegate, who always prove themselves willing guides and packers and able boatmen. There are two practical routes by which the interior coal lands can be reached. One by boat to the mouth of the Honna river, which flows into Bearskin bay, Skidegate inlet, and thence by trail to Robertson, Wilson, Anthracite and other camps. The other, an interesting but more circuitous route, is by sloop up the east coast to Masset village, on the north shore of Graham island, thence by canoe to the head of the great Masset inlet, which penetrates in a southerly direction into the very centre of the island. If the canoe is of suitable size there is no difficulty in poling and rowing up the Yakoun river as far as the Yakoun lake. The river passes within a mile of Wilson camp. From the Yakoun lake a great many important points may be easily reached.

The climate of the islands is generally temperate, and drier than most of the islands on the West Coast of British Columbia. The best time of year for travelling is from May to September, when the days are long and spells of dry weather may be enjoyed.

Personally, I met with no difficulties as to route, as I was fortunate in meeting at Skidegate Mr. W. A. Robertson, one of the earlier discoverers of coal on Graham Island, and part owner of certain of the coal lands which will afterwards be described. He kindly placed his time at my disposal, and by his personal guidance enabled me to make as thorough an examination of the field as the character of the country permitted. The map accompanying the report was constructed from the plan of the Yakoun coal lands, by Mr. H. E. Parrish, C. E., M. E., and from notes taken during a rough running traverse, the accuracy of which was controlled by tying on at intervals to the corner posts of the quarter-sections into which the greater part of the coal lands have already been laid out by the Provincial Government surveyors. Owing to the dense vegetation, it was impossible to obtain sufficient data to make a satisfactory geological map, and it will, therefore, be necessary, during future operations on the coal field, to supplement the information gained from surface examination by systematic boring.

The coal of Queen Charlotte islands belongs to the Cretaceous period, the rocks of which are chiefly exposed in the middle section of the group of islands. The southern portion is formed by the older rocks. The Cretaceous rocks in the northern portion are practically overlaid by the Miocene formation. Considerable detail is given of the geology of the islands by Dr. George M. Dawson, in his report on Queen Charlotte islands, 1878, and the following extract from his report contains statements which have an important bearing on the coal fields :—

"After the deposition of the '*older rocks*' (italics my own) and before the newer series with which the coal is associated began to be formed, a period of some disturbance must have

intervened, to which a great part of the granitoid intrusive rocks of the region are possibly referable. Portions of these older rocks were raised above the sea level at this time and the deposition of the Cretaceous coal-bearing rocks was inaugurated. This did not proceed uninterruptedly, however, for we have evidence of the occurrence of a period of great volcanic activity, which led to the intercalation of several thousand feet of almost unmixed volcanic products. Following this without any marked unconformity was a tranquil period, during which a great thickness of shales and shaly sandstone was deposited, and in connection with the earliest beds of which the Skidegate coal was formed. The overlying conglomerate probably evidence a period of depression, after which, and closing as far as we know the Cretaceous period in this region, an upper series of shales and sandstone was produced in a shallow and quiet sea. The great period of disturbance and mountain formation for the region now supervened, and the only record we have of the time elapsing between the Cretaceous and later Tertiary is in the flexure, crumpling and fracture of the beds.

"It would seem that during the period of the Tertiary period represented by the rocks of the north-eastern portion of Graham island, the general relative level of sea and land has not been far different from that now obtaining. Wide areas, probably including much swampy land, were covered with a dense vegetation, which in favourable circumstances gave rise to lignite deposits. There may have been several minor alterations of level, of one of which we have evidence at Skonun point, in the stratum of marine shells which overlies the lignite. The records of the period are closed by the great volcanic flows, which were probably supplied by a number of different centres of eruption, the approximate positions of some of which are shown by the coarse agglomerate beds."

Dr. Dawson gives the following five subdivisions of the cretaceous rocks in descending series:—

(*a.*) Upper shales and sandstones, deposited in quiet and shallow sea:
(*b.*) Coarse conglomerates, indicating period of depression:
(*c.*) Lower shales and sandstones with coal and iron ore, laid down during tranquil period:
(*d.*) Agglomerate-volcanic products, laid down during period of great volcanic activity:
(*e.*) Lower sandstones resting unconformably on older rocks (Triassic, &c.).

By following closely the tortuous shore-line of Skidegate inlet, which exposes a section of the measures, no difficulty was found in making out the five subdivisions. At the points where the coal-bearing lower shales outcrop, only in the vicinity of the Slate Chuck valley can the outcroppings of an important coal seam be seen, showing that as far as applies to the Coast, the area of coal formation has not been widespread. The coal seam of the Cowgitz mine varies from two to six feet in thickness, and occurs in beds of black carbonaceous shales which have been tilted to the vertical, and even beyond, by the great mountain uplift in the vicinity. This disturbance has been the cause of considerable flexure of the strata and intrusions of dykes, as well as the conversion of the coal to anthracite.

During the years following 1865, the Queen Charlotte Coal Mining Company operated in the valley running northward from Shoal bay, a small bay on the north shore of Long arm, Skidegate inlet. A large portion of the available funds were spent in surface works before the ground had been thoroughly prospected, and, therefore, failure to locate a workable seam of anthracite resulted in the closing down of the mine in 1872. Now that there is an ever increasing demand for iron ores, it is important to point out that lenses of clay ironstone occur in the black shales, and future exploration may reveal iron beds of commercial importance. These iron ores, if found in sufficient quantity, will prove of great value for mixing with the dense magnetite ores of the West Coast, to secure economical furnace practice.

Iron Ore.

The running traverse which was carried through the coal lands began from the mouth of Honna river and was run along the trail which leads to Robertson's camp, in the interior. The course was chiefly northerly, through a densely wooded, rough, hilly country, characteristic of massive conglomerates. About a mile from 11-Mile camp the conglomerates were overlaid by the upper sandstones and shales, which formed even, rounded hills. The general topography of the country is influenced by the character of the underlying rocks, shales here forming even, rounded hills, and conglomerates a rugged, hilly surface. The upper series then gave place again to the conglomerates, and further along the trail the junction of the conglomerates with the coal-bearing lower sandstone and shales was seen. Near this point the shales were much broken and crossed with veinlets of calcite, due to the influence of earth movements caused by later volcanic disturbances. The trail now led through a rolling country, suggestive of flexed, shaly strata.

Not far from the conglomerates, about 1½ miles to the north-west and near the main trail, there is an outcrop of coal 8 feet thick, with sandstone roof and clay floor, which dips at an angle of 75°. The partial alteration of the coal to anthracite and the tilting of the strata is due to a mountain uplift to the westward. The amount of development here is small, and consists of a short cross-cut and drift sufficient to prove the width of the vein near the surface. A considerable amount of prospecting, however, has been done on the coal outcrops at Camp Robertson (on Section 20, Township 5), which lies 1½ miles in a northerly direction from Camp Anthracite. Mr. H. E. Parrish, under whose direction the development operations at Camp Robertson were conducted, mentions in his report that he proved three distinct seams of coal: No. 1, 19 feet thick; No. 2, 13 feet to 14 feet, increasing to 14 feet 8 inches; No. 3, overlying No. 2, 7½ feet. I, however, failed to make out more than one coal seam on the field, and am certainly of the opinion that Mr. Parrish's description is far from being convincing. Examination of the walls of the tunnels and surface exposures show that the measures in the vicinity of the coal outcrops are much fractured and disturbed, and no doubt the folding of the strata, coupled with finding outcrops out of line, gave rise to the opinion that there was more than one seam. The Camp Robertson seam very probably belongs to the same horizon of coal formation found at Anthracite Camp, and, indeed, may be an extension of the same seam. The local disturbance of the seam is due to the formation of an anticlinal fold by a post-Cretaceous disturbance.

Due west from Camp Anthracite, on the other side of a mountain uplift and near the east shore of Yakoun lake, more anthracite outcrops to the surface. The anthracite lies in the form of lenses, with slickenside surfaces, in a belt of uptilted, sheared, black carbonaceous shales, which also contain masses of clay iron-stone. It is evident that the strata have been subjected to local movements. Imbedded in the shales are coked remains of what was once drift-wood. The shearing, with accompanying coking and alteration of the coal seam, is evidently due to a number of dykes which cross the country east and west, immediately to the south of the seam, and of which the outcrops can be readily seen exposed on the shore of Yakoun lake. The black argillites of the Cowgitz mine are similar to these shales, but have not been subjected to the same amount of shearing. At a higher elevation, near the top of a rounded sandstone hill, there is a vertical seam of coal with sandstone floor and roof, which indicates that there must be more than one horizon of coal formation. This seam seems to be of later origin than the anthracite seam in the black shales, as it is further removed from the agglomerates.

Yakoun lake is a beautiful inland sheet of water, from which can be seen, to the west and south, the great mountains, rugged and perpendicular. That the period of great mountain formation occurred later than the laying down of coal and cretaceous rocks, can be learned

YAKOUN LAKE, QUEEN CHARLOTTE ISLANDS.

from the severe uptilting of the strata, even beyond the vertical, in the vicinity of the mountains, and the folding of the rocks over wide areas, perhaps over the entire coal field. To the north and east can be seen, on the other hand, a rolling country, with an extensive plateau, an area evidently less disturbed by the mountain uplifts than the part of the coal field just under discussion. The most important outcrop of coal in this part of the coal field occurs at Wilson camp, which lies 8 miles a little west of north from Robertson's camp. By trail the distance is over 9 miles, and although the country is often flat or gently rolling, it is so generally wet and boggy that walking is difficult. There are but few rock exposures between Camp Robertson and Blackwater creek. The latter affords, however, an opportunity of identifying the strata. The exposures were chiefly shaly sandstones, bearing numerous fossils similar to those occurring in the lower sandstones and shales in Skidegate inlet. Thin seams of coal and float coal were also seen, which further proved that the strata were those of the coal-bearing series. The trail now passed over the great Wilson plateau, which has a general elevation of 850 feet above sea level. For about a couple of miles the trail passes over a rolling country and gradually descends to Camp Wilson, which has an elevation of 200 feet. The Camp Wilson seam, which has been prospected by an incline, is about 10 feet thick and is composed of good bituminous coal. The strike of the seam is very similar to that at Camp Robertson. The dip is somewhat steep, being about 60°. The roof and floor are composed of soft, gray, fine-grained, shaly sandstones. The strike of the coal can be followed for a considerable distance and there was no sign of disturbance by igneous dykes. The rock exposures on the Yakoun river, which lies about a mile to the west of Camp Wilson, are soft sandstones and arenaceous shales, with fossils such as are commonly seen in the coal-bearing lower shales and sandstones. The exposures in the creeks flowing into the Yakoun river in the vicinity of Camp Wilson are also shales and sandstones, with here and there coal float and thin seams of coal in the sandstone. The regularity of the strata underlying the coal seam as far as exposed points out that the coal has been formed on a regular floor. Until the country is more thoroughly prospected, however, it will be impossible to say how extensive the coal beds are, but from indications given in the creeks it would seem that there is a tendency for the beds to thin out. Systematic boring, however, would prove the limits to the coal beds. In the vicinity of Camp Wilson the strata dip steeply to the eastward, and as this applies to a considerable area, it shows that the great upheavals to the westward have caused widespread folding. The dip of the coal (60°) is not however so steep as that of the shales of the Yakoun river further west (70°), so that the coal seam may be expected to flatten out with depth. Speaking generally, it would seem that the northern part of the coal field is more suitable for mining operations than the southern part, which is somewhat too near the great mountain uplifts. However, as anthracite is only found in uptilted strata in mountainous countries, important commercial seams may be discovered, especially as the indications at Camp Anthracite and other points are excellent, although requiring to be thoroughly prospected to determine their value.

When reporting on a coal field it is always necessary to refer to transportation facilities. Happily, in the case of Graham island, nature has placed no barriers for the removal of her treasures to points of consumption, as less than 25 miles of easily, and therefore cheaply, constructed railroad would open up the whole coal field. The main line, starting from the north end of the coal field, would follow up the practically level west bank of the Yakoun river to Yakoun lake, there being only a gradual rise of 75 feet in 10 miles (Parrish). The line would then skirt round the north shore of Yakoun lake and along the west shore; thence through Yakoun pass to Yakoun bay, Rennel sound. Yakoun lake is only some four miles from Rennel sound, and this would prove the most expensive portion of the line, as the highest point of the

pass is some 600 feet above sea level. However, there are no serious obstacles worthy of mention to be overcome. Other points of the coal fields, such as Robertson's and Anthracite camps, can easily be reached by branch lines, following up the sides of the creeks flowing into Yakoun river. Yakoun bay, where the line would terminate, forms a magnificent deep harbour, protected on the north, east and south sides by a horse-shoe chain of mountains, and to the west by Shields island. The Yakoun bay opens out into Rennel sound, which is about 10 miles long and provides a clear run in for vessels from the Pacific Ocean. Thus the conditions for reaching the markets of the Pacific Coast are excellent. Other natural advantages are ideal, as everywhere there is an abundance of mining timber, plenty of fresh water and a temperate climate. In the meanwhile the Yakoun river, which flows out of Yakoun lake and practically drains the greater part of the interior into Masset inlet, affords a ready means for getting machinery in for prospecting purposes. In flood waters there would be no difficulty in working up a scow to any point along the river, after a little preliminary work in cutting out the log-jams.

In conclusion, it seems a pity that with so many natural advantages, lack of enterprise prevents the testing of the field for a workable seam of coal, as even now there is sufficient promise to warrant speculation.

CARIBOO DISTRICT.

Cariboo District is divided into the Cariboo and Quesnel Mining Divisions, with Mining Recorders' offices at Barkerville and Quesnel Forks. The office of the Gold Commissioner of the District is at Barkerville.

It is unnecessary here to detail the history of Cariboo, which is practically the history of the Province for a certain period, but no description of the District would be complete without some mention of its past, for on this we base much of our confidence in its future. The records of output, prior to 1874, are rather uncertain, but, as near as can be ascertained, the output of the Cariboo District from 1858 to date amounts to about $37,500,000. Of this amount from $25,000,000 to $30,000,000 are properly credited as the production of 2½ miles of Williams creek and 2 miles of Lightning creek, the deep channels of these streams having been worked only as far as noted, when the depth of the channel and the volume of water to be handled became too great for the appliances then available. The greater portion of the remainder of the gold produced by the District came from the surrounding creeks, all within a comparatively small district.

All that will be here attempted will be to give an idea of the mines and claims in actual operation in 1902, as illustrating in the most practical way the conditions of mining as they now exist in the District.

Transportation. As to transportation facilities for getting supplies, etc., into the District, they have not materially changed since the construction of the Canadian Pacific Railway, except that the roads are much improved. Ashcroft is the point of departure from the railway. From here a stage runs twice a week in summer and once a week in winter to Barkerville—285 miles—while from the 150-Mile House stages go once a week to Quesnel Forks and Bullion, 60 miles, and to Harper's Camp, 35 miles. The roads are good, the numerous stopping houses are clean, comfortable and reasonable as to price, and the stages as comfortable as stages ever are. The stage company carries both mail and express, running "specials" whenever the traffic justifies it. The freight rate from Ashcroft to Barkerville is 6c. per pound, and to Quesnel from 4c. to 5c. These rates, of from $100 to $120 per ton, seem almost prohibitive as to heavy mine machinery, etc., and often amount to more than the cost of the article; yet, while they are high, the rates are not extortionate, as at these figures there is nothing more in it than bare wages for the freighters, so that these amounts will not be materially reduced until a railway of some sort is built into the District.

Supplies. Most of the larger mining supplies are brought in on direct order to the various mining camps, but articles such as food, clothing and all the minor supplies required by the prospector or miner can be obtained in the District at Barkerville, Stanley, Quesnel, Quesnel Forks, Keithley, Bullion and Harper's, as well as at the "150," Soda Creek, etc., on the stage road.

Geology. The geology of the District has been thoroughly described by Mr. Amos Bowman, an engineer of much experience in placer-mining geology, who was specially engaged by the Canadian Geological Survey for the purpose, and whose report is to be found in the Annual Report of the Survey for 1887-8, supplemented by detailed maps of the District, published in 1895, these survey maps being

prepared with the assistance and co-operation of the Provincial Government. Since the publication of these maps no new facts have been brought to light, and they, as well as the report, may be considered as up to date. Copious quotations from the report so referred to will be found in the report of this Department for 1897.

The whole of the Cariboo District may be generally and roughly sub-divided into two parts, namely, that portion of the country which has an elevation above the sea level of from 2,000 to 4,000 feet, and that which lies at a still higher elevation. The first mentioned, low lying section comprises the large valleys and plateaus of pre-glacial days, with the larger old river channels which cut them, such as the Quesnel River District. The latter or elevated portion was in pre-glacial days, as it is to-day, the mountainous region of the District, where the streams had their source, and is represented by the Barkerville District, of which the town of Barkerville is the centre. Behind the town Mount Agnes rises to a height of 6,200 feet above sea level, and from this centre most of the important gold-bearing creeks seem to have radiated. In this high level district the valleys are above 4,000 feet altitude; they are narrow and are more clearly defined by definite rock formations. These same rocks defined in a general way the older channels, so that, more or less, the drainage channels of to-day follow those of the time when the gold-bearing gravels were being deposited. It is not meant by this that the ancient and modern streams flowed in the same channels, for they did not, nor did they often flow at the same level, but they were both confined within bounds by the same higher mountains of solid formation and within valleys with solid bedrock at no very great depth. To quote from Dr. G. M. Dawson on this point: —"The old stream-courses of the Cariboo District are found to have pursued very much the same directions as their present representatives follow, crossing often from side to side of the valley with different flexures, and occasionally running through below a point of drift material projecting into the modern channel, but never, I believe, actually leaving the old valley or running across the modern drainage system, as is so often the case in the deep placers of California and Australia."

This very confining of the channels effected that concentration of the values which made the rich placers of the early days, and to-day renders workable and profitable a number of small hydraulic propositions, operating on comparatively limited deposits of gravel containing unusually high gold values and occurring as old, high channels or benches, or as ancient and buried outlets of creeks, where the modern creek has cut a new channel for itself. The ancient gravel-bearing streams, after leaving the confined mountain valleys, issued into the wider, more level valleys or plains, spreading out more, their courses being less sharply limited, their flow slower and their channels larger. These latter represent the great gravel deposits of the Quesnel and its tributaries, of Willow river, Cottonwood, etc., which are, on the whole, larger and lower grade, while their course is more obscure, having in many cases been covered with subsequent flows or lake deposits.

Speaking of the distribution of the placers, Mr. Amos Bowman says:—"It is found that those parts of the Cariboo country which have a record in placer mining can be included within the red lines G.G. and H.H. (*see* map), forming a circuit with a diameter of 40 miles, of which Cariboo mountain is the centre. The periphery is represented by a circular belt of about 10 miles in width. It includes the diggings (beginning at the north-west and following the hands of a clock) on Lightning creek, Ruchon creek, Willow river, Sugar creek, Hard-scrabble, Slough creek, Red gulch, Mosquito creek, Lowhee creek, Williams creek, Grouse creek, Cunningham creek, Harvey creek, Snowshoe and Keithley creeks, Goose creek, Duck creek, Spanish creek, the North Fork of the Quesnel, Kangaroo creek, Cedar creek, the South Fork of the Quesnel, Morehead creek, and the main Quesnel river, and covers all of the formations described in the district, that of the gold schists being the only one remarkable for the wealth

and permanence of its diggings. A feature attending the entire list of creeks, embracing the placer mining country generally, is the width and depth of the erosions peculiar to the placer area. Accumulated wealth in the form of placers is simply representative of a great thickness of the country-rock, including quartz veins, disintegrated and removed. Its metal has been concentrated and retained, along with the heavier rocks and the harder gravels which resisted disintegration."

The great, low-grade deposits have received their chief development about Quesnel Forks, and chiefly at Bullion, where the Consolidated Cariboo Hydraulic Company (Mr. Hobson's syndicate) has done so much work, the details of which will be found elsewhere in this Report. The channel here worked by Mr Hobson is only one of many in the immediate vicinity, some larger and quite as rich. Naturally, Mr. Hobson acquired what seems "all around" the most available deposit, but he pointed out to the writer several deposits which he has investigated since, and which he claims offer chances for larger companies than that which he is now operating. The Consolidated Cariboo may be taken as an example of what to expect, namely, gold values of about ten cents per cubic yard. Mr. Hobson claims for his company that he has leases of 500,000,000 cubic yards of auriferous gravels, and it is safe to say that he has not in these leases one-fifth of the available gravels, so that in this section alone there must be from 2,500,000,000 to 3,000,000,000 cubic yards of auriferous gravels, which there is every reason to think will be as rich as the Consolidated Cariboo deposit. The immensity of these figures is hard to grasp, but to illustrate—if 10 cubic yards yield $1 in gold, then we have here in the Quesnel section alone $300,000,000 worth of gold. This vast amount of gold is so "diluted" with sand and gravel that the only possible means of extracting it is by the use of immense volumes of water under pressure; in other words, by hydraulic mining. Mr. Hobson collects the rainfall of the season over 60 square miles of territory, which he utilizes through one monitor, with ground sluices, in from 66 to 150 days. Even then he has only sufficient water to work in one place, using from 300,000 to 600,000 miner's inches each season, or over 1,200,000,000 cubic feet of water. So it will be seen that the water is the great question; there is gold and to spare, but the auriferous gravel deposit, without water to wash it, is of no value. As far as water supply goes, Mr. Hobson has undoubtedly secured that which was most available, that is, which could be utilised with the least expenditure of capital, and from his costs an idea can be formed as to what expenditure of capital would be necessary to bring water on to other properties; the sum required would probably be much greater than it was in this first instance. From this it is argued that the immense gold reserves of this section can only be touched by companies of the strongest sort, willing and able to invest large amounts of capital to bring on water in large quantities. While this is true of most of the great gold deposits of this section, there are a number of spots where a local concentration of values has occurred, and which are and can be profitably worked in a small way.

While particular attention has thus been drawn to the Quesnel Forks section, this has been done only for the reason that in this vicinity we have the most development and the most authentic data upon which to base estimates. Similar auriferous deposits occur to the south at Harper's, to the west at Quesnel Mouth and Cottonwood, and with the northern limit undefined and unexplored.

A gravel deposit is only available for hydraulicing when it has:—

1. A sufficiency of gold, in a free state, to pay; how much this will have to be will vary with the conditions.
2. A sufficiency of gravel to admit of a large enough amount being earned to pay for installation of necessary plant.

3. A sufficiency of water under pressure to disintegrate and wash into sluices the gravels, etc.

4. A sufficient grade from the lowest part of bed-rock to carry off and dispose of tailings. Practice puts this grade at from 4 to 5 %, and it may be natural or obtained by artificial cuts or tunnels.

Other conditions there are which are desirable, but those enumerated are essential. There is no difficulty in satisfying the first two of these conditions in this District. The third can usually be satisfied, but not always at a permissible cost. For the great mass of the deposits the fourth seems to be the hardest condition to satisfy. In this district the bedrock, in the length of the channel, does not carry sufficient grade for sluicing, so that any channel which can only be attacked from the end must soon run to deep rock cuts, if even such are possible. So that while of these great auriferous deposits a large number are not so situated as to comply with all of the required conditions, and a number of claims have been staked in the district in utter disregard of these essentials, still, for all that, the amount of auriferous gravels which do now exist here, and which can comply with all these requirements, is so great as to leave the quantity of available gravel beyond all question, and the whole future of the district turns on the cost of getting water in sufficient quantity.

In this lower portion of the District there have, in the past, been a number of bars and flats on the rivers and benches which have been very rich, notably those of the South Fork of the Quesnel, but it would appear that each of these was a local re-concentration of an older channel. Of the great channels there are only the recent records of a few claims to indicate the values, since in the early days these channels were too low grade to be worked. In the Barkerville district, however, as already noted, the channels are more confined, they are traceable to their origin, and the upper portions of these very channels were the actual producers in the early days.

In certain instances, as for example, on Lightning and Williams creeks (the two richest streams known), the "pay" was followed down the channel until, as the channel gained both depth and width, the mining, following the bedrock, became too difficult for the primitive appliances available in those days, and had to be abandoned. Such abandonment was not due to any particular diminishing of values recovered, but was caused by the increase of cost of recovering such values, and the question comes to be, can we mine sufficiently cheaply to-day to make a profit where none could be made at the time the mines were abandoned? In those days wages were much higher than they are to-day, and the cost of machinery was at least double, if it could be obtained at all. Supplies of all sorts are now, also, very much cheaper than formerly, and as these are the chief items which make up the cost of mining, it can be safely said that the cost in 1903 should not be more than half what it was from 1860 to 1870. On this one point hangs much of the confidence we have in the future of the Cariboo District. Not only can we to-day mine cheaper, but we can, by the use of modern machinery, mine ground which a few years ago it would have been absolutely impossible to work. Under this latter head come such propositions as the "Gold Fields" operations on Williams creek, where the tailings are raised by a bucket elevator; or Ward's hydraulic, where they are raised by a hydraulic elevator; or the Slough Creek enterprise, where the depth of bedrock was found by boring, and where, from information thus gained, a shaft and drift were made in the solid rock to get below the lowest channel, which is protected from surface waters by a blanket of clay. All these propositions will be described later in this Report, and are mentioned here merely by way of illustration.

While no attempt will be made to give the records of production of the old claims of the Barkerville District, still it is necessary to note what these records were, inasmuch as we largely base our hope of future values on the values already obtained from these identical channels, and argue from these as to similar channels As to the rich shallow placers, they have been fairly well worked out in the limited area within which such finds have been made, but there is every reason to believe that the tracing of the numerous great channels will ultimately lead to the discovery of other such fields. It is remarkable how systematically the "old timers" did trace up the shallow pay, and how thoroughly they worked it out; but that certain parts of the district escaped their notice and remains yet to be discovered is proved by the finds made this past season on the bench at the old *Van Winkle* and *Point* claims, on Lightning creek. In the former, "pay" ran from 6 to 9 ozs. to the 8-foot set, up to 50 ozs. and even 78½ ozs. per set, while in the adjoining *Point* claim as much as 56 ozs. is reported from one pan. This gold, of which the writer had the opportunity of seeing several thousands of dollars worth, was almost entirely coarse, ranging from grains up to flat slugs of from ½ to 6 ozs. Whether these two claims are on a bench of the old channel or on a new channel has not been decided as yet; they are, however, scarcely shallow placers, as the drifting is being carried on 40 feet below the surface.

Of the total amount of gold taken from Cariboo, a very large proportion of it came from the deep diggings of Williams and Lightning creeks, and the very channels then worked are now about to be opened up at adjacent points, with what prospects may be estimated from the past records of the channels when worked. To show what these deep channels did produce, the following is quoted from Dr. Dawson's 1887 Report:—

"YIELD OF CLAIMS ON LIGHTNING CREEK.—It is impossible to present complete returns of the amount of gold obtained from the old bed of Lightning creek, but the following approxmate statement to November 1st, 1875, published in the Report of the Minister of Mines of British Columbia for 1875, is still of interest, in showing how large this amount, in the aggregate, must have been. The claims are here arranged in their order following down the creek:

Campbell and Whitehall	$200,000
Dutch and Siegel (now Perseverance)	130,000
Dunbar	30,000
Lightning	153,962
Discovery and Butcher	120,000
South Wales	141,531
Spruce	99,908
Point	136,625
Van Winkle	363,983
Victoria	451,642
Vancouver	274,190
Vulcan	56,955
Costello	20,476
	$2,179,272

"It would probably not be an exaggeration to state that the deep channel, for the portion of its length above referred to, with the adjacent side ground worked at the same time, has yielded, throughout, gold to the value of over $200 to the running foot."

Also:—"As showing the great local accumulation of gold in the deep channel of Williams creek, and indicating its local origin, the following approximate statement of the value of gold obtained in various claims, covering certain lengths of the channel, is important. All these claims were below "the Canyon," but they do not form a consecutive series, no such details being available from any other claims:

Adams	100 feet,	$ 50,000
Steele	80 "	120,000
Diller	50 "	240,000
Cunningham	500 "	270,000
Burns	80 "	140,000
Canadian	120 "	180,000
Neversweat	120 "	100,000
Moffat	50 "	90,000
Tinker	140 "	120,000
Watty	100 "	130,000
	1,340 "	$1,440,000"

Platinum.

It has long been recognised as a fact that platinum, and sometimes its related metals, occurs associated with the placer gold of the various parts of the Province. With an idea of locating the source of these metals the Provincial Mineralogist secured a number of samples of black sands from various parts of Cariboo, and these have been analyzed by the Provincial Assayer, whose results will be found embodied in the table following, in which the locality from which the samples were derived is also given. From this it will be seen that the distribution of the metals is wide, a fact which has so far defeated the attempt to locate their source, but the investigation will be continued:—

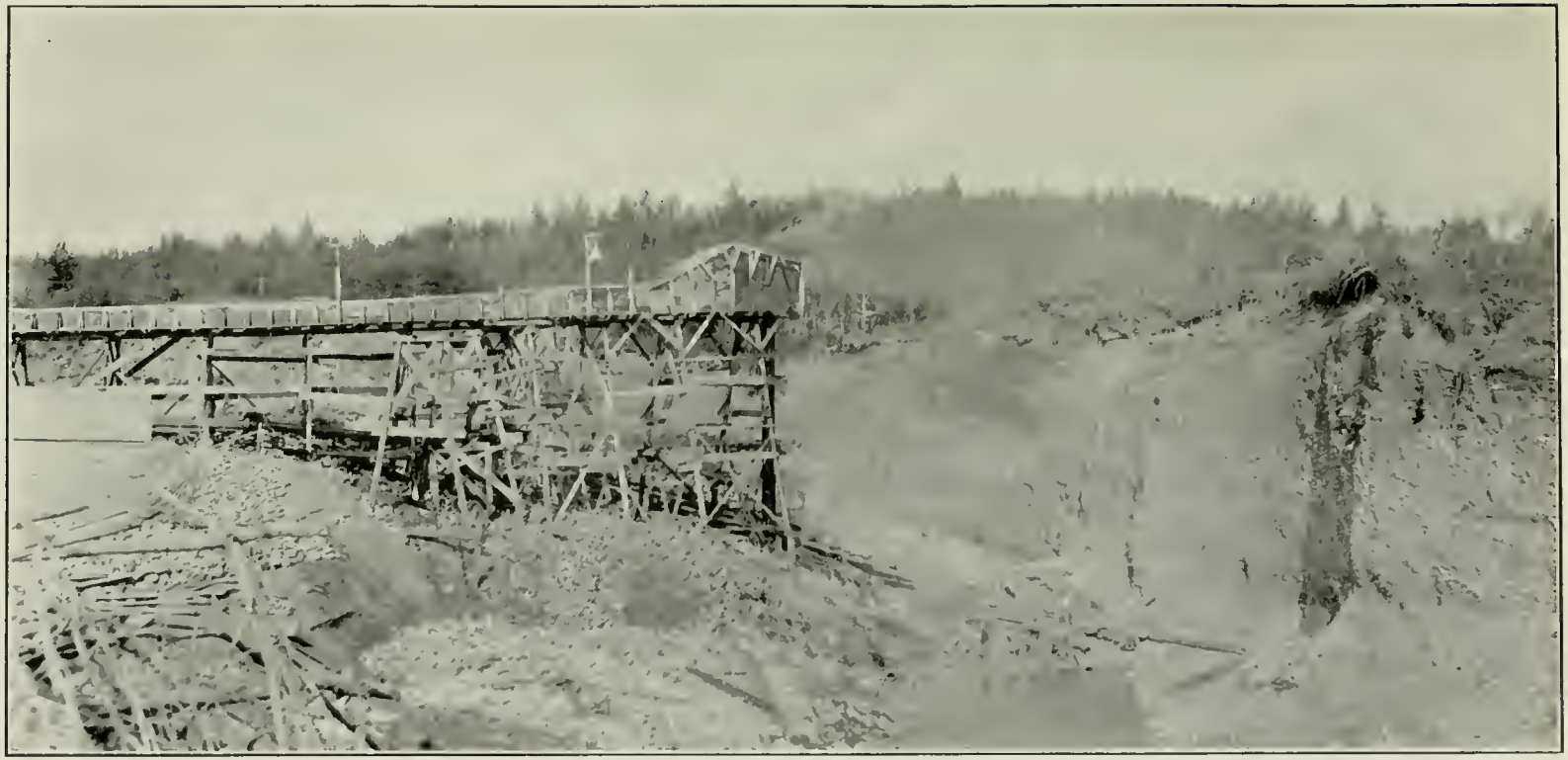
Locality of Samples of Black Sand.	Assay Value Per Ton.			
	Gold, oz.	Silver, oz.	Platinum, oz.	Osmiridium, oz.
Head of Harvey Creek	.....	.....	None.	.....
Upper Cunningham Creek	.....	.....	"	.....
Fraser Creek, Horsefly	.....	.....	"	.....
Eureka Creek, Horsefly	.....	.....	"	.....
Cottonwood Creek	.....	.....	"	.....
Keithley Creek (Hayward claim) black sand and pyrites.	5.9	2.0	"	.....
Quesnel River, 82 miles above mouth	3.8	Not determined.	1	.....
" 40 " "	1.0	"	2.8	.....
" 40 " "	0.06	"	0.14	.....
" 25 " from mouth	0.2	"	0.4	.....
" 13 " above Quesnel	4.7	"	7.8	.....
† " 30 " "	.....	"	6.4	.....
†Fraser River, 2 " "	.....	"	2.4	.....
Quesnel River, 25 " below Forks	1.0	Trace.	0.5	.....
" 25 " "	2.5	"	2.5	.....
Three miles above Quesnel	0.85	Not determined.	0.25	3.2
*Quesnelmouth (concentrates)	7.1 %.	"	71 %.	3.1 %.
Consolidated Cariboo Hyd. Mg. Co.	.....	.....	70 %.	3.5 %.
‡Horsefly River, Harper's Camp	.....	.....	25 %.	4.5 %.
Fraser River, 15 miles above Quesnel	121.8	"	3.9	.....
Cobeldick dredge, Quesnel, Fraser River	913.	"	165.7	.....

† Mostly platinum; other metals not assayed.

* $\frac{7}{10}$ oz. of mineral giving:—Gold, 0.05 oz. troy; platinum, 0.5 oz. troy; osmiridium, 0.022 oz. troy.

‡ Mr. Hobson says that this platinum is found in the proportion of 1 oz. platinum to 100 oz. gold.

From this it will be noted that platinum occurs throughout the drainage area of the Quesnel river, but that it is also found on the Fraser above Quesnelmouth, and that it follows the Fraser down to Lytton. The samples obtained do not indicate its presence in the Barkerville district, though samplings from this section may reveal it.



WARD'S HORSEFLY GOLD MINING COMPANY, HARPER'S CAMP, HORSEFLY RIVER QUESNEL MINING DIVISION.

UPPER HORSEFLY.

August 18th. On this date the Provincial Mineralogist left Harper's camp for the Upper Horsefly river. There are two routes by which this latter section of the country can be reached,—one by a trail following up the north side of the Horsefly river for a distance of about 65 miles to Eureka creek, and the other, not available for horses, by way of Horsefly lake and thence over a foot trail from the end of the lake to the forks of the north and south branches of the river, where the main river trail is struck. The pack-train and horses had been sent off up the river trail early the previous day (Sunday), in charge of an Indian packer, with orders to be at the Forks, a distance of some 50 miles, on the 20th at noon. The Provincial Mineralogist, accompanied by Philip Fraser, H. N. Campbell and others, being those who had made the first locations in the District, left Harper's after noon, going by a trail some 4 or 5 miles long to the western end of Horsefly lake, where Hansen, a local boatman, had boats in readiness. Profiting by a light westerly wind, sails were set and, assisted by oars, Hansen's island, a small island about 10 miles up the lake, where Hansen has a good cabin, was reached by dark, and here a stay over night was made.

August 19th.—An early start was made this morning, and as a favourable, though light, breeze was blowing, the boat's ordinary sail was supplemented by a tarpaulin bed-sheet on a sprit, which sent the heavy and clumsy flat-bottomed craft along at a fair rate. By 4 p. m. "Knight's Hotel" was reached. This "hotel" is a large and substantial log house, built by Arch. Knight and partners on a small bay on the south shore of the lake and within about 4 or 5 miles of its eastern end, in anticipation of an expected "rush" into the Horsefly country in the spring of 1902—a rush which, however, never materialised, and the hotel was never finished. From Knight's Landing the trail to the Upper Horsefly starts, while directly opposite, on the south side of the lake, a short trail of 3½ miles leads over a low pass to an arm of Quesnel lake.

Horsefly lake is from 35 to 40 miles long, and is surrounded by mountains with comparatively sloping sides, while between the base of these hills and the lake there are numerous stretches of flat land, all being covered with good, merchantable timber, chiefly spruce and fir. Towards the eastern end of the lake there are two or three valleys on the north side, containing splendid cedar timber. The shores of the lake are clean and usually gravelly, with few weeds, as the water is deep. There is plenty of game in the forests bordering the lake, particularly towards the eastern end, where deer and bear, as well as grouse, are plentiful, with ducks upon the water. The fishing in the lake is unusually good at most seasons of the year, chiefly rainbow and silver trout of large size, the writer taking a number, in going up the lake, weighing as high as four pounds each, while he is reliably informed by a prospector that four 12-pound trout were taken by himself in one day in the early summer. There are few rock exposures to be seen along the lake shore, as it is covered with surface soil and vegetation. Directly north of Knight's camp there is a rocky bluff, the terminus of a rocky and precipitous range running north and south. This bluff, seen from the lake, appears to be a fine-grained, igneous rock, greenish in appearance and much fissured, showing quartz veinlets and, in one place, an extensive copper stain on the face, which has been partially investigated, but without discovery of any workable quantity of copper ore. In anticipation of a "rush" in 1901, the Cariboo Trading Co. purchased the entire machinery for a screw steamer, which, together with all the lumber necessary for a boat of about 60 to 70 feet in length, is now stored at the west end of the lake, never having been put together owing to the collapse of the Horsefly boom.

August 20th.—The trail from Knight's camp to the Upper Horsefly follows up the east side of a small creek, through heavily timbered flats at first, but soon striking the sloping hillside.

Barometric observations showed Horsefly lake to be 1,000 feet higher than Harper's camp, while at 4 miles out the trail under consideration is 1,250 feet higher than the lake, an elevation which is maintained with certain fluctuations for the next 4 or 5 miles, the "summit" being 1,300 feet above the lake, or 4,300 feet altitude, from whence the trail gradually descends to the Forks, at an altitude of 3,850 feet, the total distance from Horsefly lake to the Forks being from 12 to 14 miles. The trail is only a foot trail and has a very poor bottom, so that it could scarcely be used or even made fit for use by pack animals, although another could undoubtedly be made higher up the mountain side.

The Forks were reached about 2 p.m., and the Indian with the horses was found waiting, having arrived a couple of hours previously. As this was the last place where feed could be had for the horses before reaching Fraser creek, 15 to 20 miles distant, a stop was made at this spot for the night. At the Forks the north and south branches of the Horsefly river meet, the north fork flowing from the north-west and the south fork from the south-east.

No gold has been found in the wash of the North Fork, and, judging from the gravel in its bed, its course is almost exclusively through a granite country. It could not be learned that any prospecting had been carried on up this branch of the stream, which rises in the mountains lying to the east of Horsefly lake. The South Fork, however, carries gold on all its bars. This gold is in a very fine state of division and, apparently, is fed in from the streams entering from the south. The wash is quartz and slate, with occasionally pebbles formed from close-grained, igneous rocks. It is, however, not the old gold-bearing gravel found in the District, nor has it any of its characteristics, being purely local and modern.

August 21st.—Camp was moved from the Forks, up the South Fork to the mouth of Fraser creek, a distance of about 15 to 20 miles, over a trail very soft in places and in others very rocky, and through a district where a good trail could easily be made by keeping up on the bench. Fraser creek is the last stream flowing from the south-east into the South Fork. The latter curves to the south a couple of miles higher, rising in the same snow-pile as does Fraser creek. The gold excitement in the autumn of 1901 centred on Fraser and Eureka creeks, the latter a stream flowing from the south into the south branch of the Horsefly, about 12 miles above the Forks. Fraser creek is from 3 to 4 miles long, the stream bed rising in that distance some 650 feet to a basin almost circular in shape and half a mile in diameter. This basin is surrounded by walls, which rise at an average angle of 45° to a height of 1,500 to 2,500 feet, and are composed of slates shales and sandstone, usually dark but towards the higher elevations showing a light-coloured bed containing much silica, the whole being much metamorphosed, and having here a somewhat uniform dip to the west of from 30 to 60 feet. These shales are cut by a main series of quartz veins, having a N. 75° W. strike and nearly vertical dip, and are accompanied by innumerable parallel veinlets. The main series shows three or four veins cutting the formation, and these, as exposed, seem to pinch and swell, forming lenses of nearly solid white quartz from 30 to 40 feet wide, and probably 300 to 500 feet long. This series of lenses appears to have great strength and continuity, as from the summit of the hills, by the aid of a field glass, its outcroppings can be seen in line for 4 or 5 miles to the eastward, crossing the valley of the main creek and up the opposite range of hills. To the westward the quartz is visible on that side of the basin to within from 300 to 500 feet of the top, where it and its containing shales are capped with a volcanic rock, basaltic in character and showing porphyritic structure in places, evidently a remnant of a basaltic capping which covered a large area of country, as other isolated cappings of a similar character are noted on other peaks of about the same altitude (7,500 feet). Continuing westward, these quartz veins are seen in the adjoining basin of Slide creek and cross over into the next basin at the head of Eureka creek.

Fraser Creek.

Almost the whole length of these exposures has been covered by mineral locations, but upon none of them has any development been done. Through the quartz are scattered masses of iron pyrites which, so far, have not been proved to occur in such quantity as to amount to more than 1 % or 2 % of the quartz as it would have to be mined. A number of assays have been made on samples from the various quartz outcroppings, and show the rock to contain from 40 cents to $3.60 per ton in gold, while an assay of concentrates panned in the Government Laboratory gave an assay of 16 ozs. per ton in gold.

To the south of the range forming the southern watershed of the South Fork is the valley of Crooked river, along both slopes of which similar quartz veins are reported, showing similar mineralisation. Samples were obtained for assay and gave like results. To the south of Crooked river lies the Canim lake country, from which also returning prospectors bring samples of similar quartz, frequently carrying galena which is low grade as to silver contents. It would appear that between the Horsefly river and Canim lake there is an immense amount of quartz occurring in lenses and veins in the slate, but, while much of this quartz carries sulphides of iron and lead, as far as can be learned the values are not such as to admit of its being worked under existing circumstances.

The wash in Fraser creek is all of it attributable and traceable to the rock formations surrounding its basin, and consists chiefly of flat flakes of shale and slate with some partly rounded quartz, while in the sides of the creek are found considerable quantities of bright iron sulphides in small grains and crystals, which are gold-bearing, as indicated by the assay already noted of the concentrates from the quartz leads.

All through the surface and subsoil of the creek valley "colours" can be obtained in the pan, with, naturally, a certain concentration in the creek bed. These colours are very fine and thin, having very little actual and individual weight. When examined with a glass they are seen to be rough and little worn, and are evidently the result of the oxidisation and decomposition of auriferous pyrites, or possibly of fine particles of free gold from quartz veinlets, or from the porphyritic rocks of the adjoining mountains, which latter, it is strongly suspected, will be found to have had more to do with the occurrence of gold in Cariboo than is generally credited.

R. H. Campbell, H. R. Campbell, P. Fraser and others prospected this creek in 1901, and obtained gold indications, as noted, almost anywhere in the soil, from which it was argued that gold in considerable quantity would be found on bedrock. In the winter of 1901-2 lumber was whip-sawed for sluice-boxes, which were set up in the spring, and as soon as the spring freshets subsided shovelling-in began. It was found that very little gold was saved on the riffles, possibly as it was too light, and that there was no concentration of gold on bedrock. After a few weeks the work was stopped as unprofitable. No work was going on on this creek at the above date, and the claims had been abandoned.

August 23rd.—In the afternoon camp was moved a distance of 5 miles, from Fraser creek to "Bacon Rind camp," about 1 mile above Eureka creek. Here good feed was found for the horses in a swamp meadow.

Eureka Creek.

August 24th.—Eureka creek divides into two branches about half a mile from its mouth, the western branch being known as Empire creek. The general conditions here are the same as noted on Fraser creek, with probably a certain concentration of gold values near the junction of these two branches of the creek, where benches have been formed with a flatter grade than has the general fall of the stream. The placer claims on Empire creek had been abandoned, but there were some 6 men still working on Eureka creek; of these, however, only two were doing any placer mining, the others being engaged in quartz prospecting Sluice-boxes had been placed in the creek bed

and considerable dirt had been washed. The wash is chiefly slate and shale, through which is found a great number of boulders, and these interfere with the work and greatly diminish the amount of earth a man can wash in a day. The gold is of the same character as that found on Fraser creek, although some small nuggets are reported, which may have come from quartz ledges, since pieces of quartz float have been found here, carrying visible gold. Robert Campbell, Sims, Craddock and partners, who were working here, together with P. Fraser and H. N. Campbell, of Fraser creek, were the discoverers of gold during the previous fall, and they have stuck manfully to their claims without, it is regretted to say, even making wages.

It now appears that there was no justification for the excitement created the previous autumn, as the creeks contain no gravel wash nor sufficient gold to enable them to be worked by ordinary placer methods, while again there is not enough pay wash to justify hydraulic methods being adopted. With regard to the excitement caused last fall it must be said that probably these men, being accustomed to the heavier gold of the old channels, were misled by the number of "colours" found, and so over-estimated the value of the diggings.

J. Craddock and others had uncovered in the banks of Eureka creek, at an elevation of only 5,075 feet, a couple of stringers of quartz about 2 feet wide and carrying sulphides, but upon these no work had been done. These are noted chiefly as indicating the width of the belt of quartz veins in this District.

August 25th.—Camp was moved from Eureka creek for 20 miles down stream to the "Slide," some 5 miles below the Forks of the Horsefly. About half-way between Eureka creek and the Forks the McCallum Bros. and three others were found working in the bed of the Main South Fork. They had been previously engaged in prospecting their claims, but at this date were whip-sawing lumber for sluice boxes. Up to that time no definite results had been obtained further than pan prospects from test pits; it was subsequently learned, however, from one of the men working there, that gold had not been found in sufficient quantity to pay. Certain creek leases had been taken up just below where this work was going on, but, from the indications of the claims above, there is not enough gold to justify either drifting or ordinary placer methods, and there is not sufficient fall in the creek bed to provide grade for hydraulic mining.

August 26th.—Camp was moved from the "Slide" (a portion of the hillside on the right side of the river swept clear of trees by snow-slides and in summer covered with good feed for horses) for a distance of 17 miles to "Little Prairie," a swamp meadow on the same side of the stream almost opposite to the mouth of Crooked river, which here empties into the Horsefly from the south. The altitude of Little Prairie and the mouth of Crooked river is about 3,550 feet. The route this day was along benches of gravel, etc., lying at the base of steeply-rising mountains. The trail was very bad at the time, but the Government crew was at work on this section, and it was expected that by the fall a good trail would be completed from Harper's camp to the Forks. The valley of the Horsefly at Little Prairie opens out into low, marshy bottom land, some 4 miles wide, apparently good soil, probably overlying gravel.

Crooked River.

The conformation of the hills and the course of the Horsefly below this point indicate that the main valley is that of the Crooked river and not of the Upper Horsefly, which latter is narrow and bounded by steep mountains, while the former is 2 or 3 miles wide and the enclosing hills rounded and covered in many places with immense deposits of ancient gravel wash. This gravel is not visible in the Upper Horsefly at all, while the valley of the Horsefly below the junction with Crooked river is composed of just such wash. Crooked river has been followed up through a succession of lakes and swampy meadows, in an almost due easterly direction, further than the sources of

the Horsefly, when it bends to the north, completely encircling all the creeks at the head of the Horsefly and being, as already noted, just south of the divide from Fraser and Eureka creeks. Coal, reported to be of good quality, has been found on Crooked river a few miles from its mouth, further emphasising the fact that this was the old river channel. The importance of establishing this point is that the gold values found at Harper's and above on the Horsefly river probably came down the valley of the latter stream, and the search for the "mother lode" of the gold has been, up to this date, almost exclusively along the Upper Horsefly, whereas every indication is that the ancient drainage valley of the Horsefly was that now known as Crooked river, and that it is up this valley that the prospecting should be directed.

There is no trail up the Crooked river other than that made by trappers in search of beaver, which are very plentiful in this lake district, but it is reported to be practicable to run a canoe for the greater part of the distance up from the mouth. Judging, however, from the difference in elevation of the Horsefly river south of Fraser creek and at the mouth (some 1,200 feet, estimated), it is questioned if the report quoted is correct, unless this drop is accomplished in a very short distance by falls and rapids. The Crooked river country is, however, accessible from the Canim lake district, entering from about Bridge creek, on the Cariboo road, as the Indians from that section come in with horses every fall for deer shooting.

August 27th.—The writer rode from Little Prairie to Harper's, a distance of 28 miles, but the pack-horses, being more or less used up by the previous two days' rough travelling, could only make Black creek, where they stayed over night, following on to Harper's next day. There are two or three important falls on the Horsefly river, below Little Prairie, which could be cheaply utilised for power purposes, if required.

The hills below the junction of Crooked river are in many places covered with a great depth of ancient whitish gravel, and these deposits extend to a considerable height above the valley, in some places forming extensive hills and benches. This gravel is generally gold-bearing, but, so far as known, not sufficiently so to be profitably worked as it stands at present. There are two or three creeks, Black, Martin, etc., flowing through this section of gravel deposits, and on these creeks certain placer mining has been done and some gold has been taken out; as, however, the claims have been abandoned, it is supposed they were not profitable.

Harper's Camp.

At Harper's camp, the Horsefly river takes an abrupt bend to the north, while Mussel, or Moffat creek, flows in from the south, the course of Mussel creek and of the Horsefly below Harper's being in line, while, as a continuation of the course of the Horsefly above Harper's we have a low valley or depression extending to the north-west, in line with Beaver river. Through this valley it is claimed that an old channel ran, and here the Miocene Company has located several leases. Harper's camp is situated at the junction of these four gravel-filled channels, but just how or which way the streams originally ran, or how the channels are related, are questions very much in dispute among those who have attempted to trace and work them. It is possible that three channels joined into one, but it is more probable that one channel merely crossed another at different periods. The camp came into prominence in the early days of Cariboo, on account of very rich placer ground found in the bed of the present stream, from which large amounts of gold were taken from a very limited stretch of river. The richer portion of the channel was not over a couple of hundred yards along the course of the river, although, naturally, more or less gold was found for some distance further down stream. This rich ground was covered by the old "Harper lease," originally granted in 1884 and containing 320 acres of ground. This lease is now held by the

HORSEFLY GOLD MINING COMPANY,

locally known as Ward's hydraulic mine, the manager of which is Mr. R. T. Ward. This is the only property in the vicinity that has ever been a producer, and upon the results of this company's operations most of the development, etc., of the camp has been based.

In the stream bed, as it originally existed, bedrock came to the surface in a couple of spots, and the earlier placer miners, starting at these points, worked down as far as the limited appliances within their means permitted, after which the present company took hold of the property and brought in a supply of water from Mussel creek, a distance of about 7 miles, by means of a ditch 5 miles long, flumed in places, and, where the elevation could not be maintained, in a 9,500 feet long, rivetted iron pipe of 30 inches, reduced to 26 and 15 inches at the monitors, the water being delivered in the pit under a head of 300 feet, or an effective pressure of 100 lbs. The company installed a hydraulic elevator, by means of which the bedrock was followed down to a depth of about 50 to 60 feet below the level of the river (a No. 3 Monitor washing down the gravel and carrying it to the foot of the elevator), the stream being directed to the east side of its bed while the west side was being mined. When the bedrock had been followed on this side as deep as the elevator would lift, this pit was abandoned, the river directed to the west side of the channel, and a similar pit sunk on the east side, where operations are now being carried on.

Bedrock, as originally found in the stream bed, was dipping to the south, but subsequent work shows that to the west the dip is to the west, while to the east it swings to that direction, the original discovery point being on a ridge and the bedrock dipping away from it to the south, east and west. The local strike of the bedrock here is so irregular that it is impossible to calculate any general direction, though there is a strong belief that it is east and west. The dip of bedrock varies from 10° to 30°, so it will be seen that the area of it that can be reached by the elevator (which is limited to a depth of 60 feet below the river) is very circumscribed, and the season of 1902 will probably see all of this area mined, as, when visited, the pit was so deep that in the lower parts the gravel had to be shovelled into the sluices, and it is probably impossible, with the available head, to elevate higher than at present (a total of about 52 feet) to the upper sluice-boxes. For the further working of the property it will be necessary to adopt some other mode of operating, as, for example, lifting the gravel by bucket elevators, such as are employed by the Cariboo Consolidated at Barkerville, or by drifting from a shaft, which would probably be sunk away from the river, as it would be very expensive to follow down the bedrock from the present pits, on account of the seepage of water.

The yield of gold from this hydraulic pit has been considerable, about $500,000. The values on bedrock were very variable, being in some spots very high and in others very low. It is reported, however, to have about paid, on the whole, while some of the ground worked this fall was very rich, $3,000 being recovered in two days. The surface gravel from this pit is clearly the gravel of the modern stream, but below this there is an old gravel, flattened and well worn, consisting of quartz, slate and rounded fragments of basalt and porphyry, many of the stones quite "rotten," and the whole presenting a dull bluish-gray appearance. It is claimed by Mr. Ward that this gravel wash or flow is identical with and a continuation of the gravel deposits found in the Horsefly Hydraulic (Hobson's Horsefly), some 5 miles down the river, and the surveys, etc., of Mr. Hobson would tend to confirm this theory, and show also that the flow was from north to south. This connection has not been actually proven, but much work has been done which renders it exceedingly probable that such is the fact, while the character of the gravel and bedrock is so similar in both places as to add very strong confirmatory evidence.

August 28th.—Word was received from the Deputy Mining Recorder, Mr. McKay, that certain mineral locations had been recorded the previous day on Mussel creek, and that the samples shown contained metallic copper. Accordingly, in the afternoon, the Provincial Mineralogist accompanied the locator, Alonzo Lucas, to his claim.

Mogul Mineral Claim.

This claim, located on August 27th, 1902, by Alonzo Lucas, is situated on Mussel creek, about 4 miles from its junction with Horsefly river. The creek here runs over a series of beds of basalt, lava and volcanic tuff, which appear to have a flow to the south-east and are cut by the stream with the formation of a couple of small falls. Imbedded in the lava were found small globules of copper, of a size from a pin-head up to almost 2 inches diameter, while in some of the softer beds were seen small flakes of copper glance. Naturally, at this date no work had been done, and the only exposures were in the creek bed. While a number of copper globules could be seen, the amount of metal visible was not economically important; yet it points to the fact that grains of metallic copper, at least, are contained in these lavas, so that the question naturally arises, do these same rocks contain globules of gold, and have they had anything to do with the gold deposits of the District? These rocks, and the occurrence of copper in them, bear a marked resemblance to the copper-bearing volcanic tuff beds found near Aspen Grove, south of Nicola.

The Miocene Gravel Mining Co., of Cariboo, Ltd.

The officers of this company are:—President, Gordon Drysdale, Vancouver; secretary, F. J. Coulthard, New Westminster; manager, R. N. Campbell, Harper's. Directly to the south-west of the Harper lease, the Miocene Company has some 12 or more leases, extending westerly through the low depression mentioned, towards Beaver lake and in line with the production of the course of the Horsefly above Harpers. In 1897, on the lease immediately adjoining Ward's hydraulic, about 1,000 feet from the Ward pit and near the line just mentioned, the Miocene Company sank a two-compartment shaft. This shaft has now been abandoned, but from information received from Mr. Campbell it is learned that it was sunk vertically for about 275 feet, when it struck bedrock, which was found to be still pitching deeper. This shaft was continued 50 feet deeper into bedrock, at which point, 325 feet below the surface, a drift 150 feet long was set off to and into the gravel, but the bedrock was still found dipping to the west. From the bottom of the shaft an incline, 200 feet long and gaining 125 feet in depth, was put down in the country rock, and another drift was run to the gravel, which was found in a distance of 60 feet, but with bedrock still dipping away at an angle of 30°. At this point, 450 feet from the surface, very fair prospects are said to have been obtained from the gravel, but no further work was done here, and the shaft was abandoned.

About 1,000 feet to the south-west of this first shaft a new shaft-house was erected in 1899 and additional machinery added, consisting of two 150 h. p. boilers, two Worthington station pumps of 1,200 gall. per minute capacity, and two Knowles sinking pumps of 400 gall. capacity, a saw-mill, electric light plant, hoist, etc. A 3-compartment shaft was sunk to a depth of 490 feet, at which point bedrock was reached and found to be still dipping at 15°. The shaft was timbered with sawed square sets and lagged with 2-inch lagging throughout in the most substantial manner. In sinking this shaft the gravel was found to be capped with about 100 feet of blue clay, and nearly 400 feet of gravel was passed through, containing gold, but not in paying quantities. The gravel is free and very uniform in size, being composed almost entirely of smooth, worn, white quartz pebbles. As seen on the dump, the gravel from this shaft is particularly noticeable, first for its light colour, occasioned by the absence from the quartz of all pebbles of slate or basaltic rock, and secondly, for its remarkably uniform size, while the individual pebbles are rounded and not flattened. In all these points it varies materially from the wash as seen at Ward's Horsefly hydraulic or at Hobson's Horsefly.

During the spring of 1900 the pumps, pumping station, water columns, etc., were overhauled and made good, and an increase of 65 feet made to the depth of the shaft, this addition being entirely in bedrock and making a total depth of shaft of 555 feet. At the 550-foot level a drift was set off for 100 feet in the bedrock, in the direction of and under the channel. From this drift an upraise of 20 feet was made to the gravel, when some water was encountered. The gravel gave fair prospects, but the indications were that the main channel had not been reached. The drift was, consequently, extended for 100 feet further, when another upraise was made to the gravel, which was struck at 15 feet above the floor of the drift. When this upraise broke through into the channel there was a rush of water and gravel, which drove the men out, although they managed to bulkhead the drift. Very little gravel was obtained from this upraise, but Mr. Campbell reports that the results therefrom were satisfactory. For some reason, only a small sinking pump had been placed at the bottom of the shaft, which, with the drift, was soon drowned out and the drift and shaft flooded. The shaft has not since been unwatered, the management having asked for, but not having received, suitable pumping appliances.

Considering all the money that has been expended upon this property (over $200,000), the excellent shaft 550 feet deep, all equipped, together with the extensive holdings of the company, it seems difficult to explain why work has absolutely stopped for two years for the lack of the few thousands of dollars necessary to instal extra pumps. If the company is satisfied with the prospects obtained from the upraises, as the manager claims it is, the work should be continued at once. But, for the sake of argument, suppose the prospects from the upraises were not altogether satisfactory, it seems equally unfair to form any estimate of the value of such a channel by sampling only the two small spots where the drifts broke through. After such an expenditure of money in getting to the channel, it seems very poor business policy to abandon work without drifting for some distance on the old channel, so as to get a more general sample of its values. As already implied, no work has been done on the property during the years 1901-1902.

The Manager, Mr. Campbell, in his reports and also in conversation, states his belief that this "Miocene" channel is the same as that in the Ward Horsefly and also the Hobson Horsefly, basing such belief on the proximity of the Ward channel and the fact that in part that channel dips towards Miocene ground; this theory, however, is not accepted by Mr. Ward or Mr. Hobson. While there is considerable probability, from the locations of these two channels, that they might be the same, such probability is very much weakened by the total dissimilarity of the wash, as has been already noted, and the seeming connection of the two channels, due to location and dip of bedrock, can be accounted for by supposing that they are of very different ages and that the one cuts the old bed of the other. The great prevalence of quartz in the Crooked river country, and the fact that the quartz veins had evidently been subject to much erosion before the period of the lava flow which capped the summit at Fraser creek, would seem to indicate the possible flow of the "Miocene" channel from that direction, and its continuance through to the Beaver lake country in an east and west direction, while the probability of the Ward and Hobson Horsefly channels being identical, and that the course of the original streams was north and south, probably crossing the other channels, is quite strong.

Great Western Mining Company.

On the east side of the Horsefly and adjoining the Harper's lease on the east are two claims, the *Emma Louise* and *Golden Nugget*, held by the Great Western Mining Company (a mining partnership, consisting of C. Gibson, Joe Lapierre, *et al*). The Ward pit is now within 200 or 300 feet of its eastern boundary line, and as the bedrock is apparently dipping directly east and disappears

GENERAL VIEW OF CONSOLIDATED CARIBOO HYDRAULIC MINING COMPANY'S PIT AT BULLION, B C

under the face at an angle of not over 15°, the Ward channel should, if this dip continues uniform, enter this Company's ground at a depth of about 135 feet. Near the Ward line, but well within the Great Western Company's property and some 200 to 300 feet to the north-east from the edge of the Ward pit, a shaft 38 feet deep has been sunk, but was then filled with water and partly caved in, while the material excavated was scattered and overgrown with grass. From what investigations could be here made, it appears that within a few feet of the surface a close-grained lava capping, several feet thick, was encountered, overlying a regular gravel deposit, the gravel from which has a similar appearance to that encountered in the Ward pit. Some 500 feet further to the north-east a shaft has been put down 65 feet, through an exceedingly promising-looking wash, but had not, on that date, reached bedrock or values. This second shaft has a temporary shed over it, in which is a steam boiler, pump, etc. It is understood that the management intend to push this shaft during the coming winter, making an attempt to reach bedrock.

Horsefly Hydraulic Mining Company.

August 29th.—The Horsefly Hydraulic mine is situated at Horsefly, some 5 or 6 miles down the Horsefly river from Harper's, and about 7 miles from the point where this river empties into Quesnel lake. The leases held by this company are 28 in number and formerly covered 1,820 acres of land, comprising 7 miles of an old auriferous channel and extending along the left bank of the Horsefly river for a distance from Horsefly of about 3 miles, but of these leases it is reported that some have since been abandoned. The property is under the management of Mr. J. B. Hobson, who is also Manager of the Consolidated Cariboo Hydraulic Mining Company, at Bullion. Mr. Hobson, hearing of the writer's visit to the District, had, with that courtesy which he so invariably extends to all visitors to the vicinity, driven all the way from Bullion to Harper's, a distance of 35 to 40 miles, in order to conduct him to and show him over the Company's properties at Horsefly. Mr. Hobson had also sent a couple of men in from Bullion to Horsefly to clear up any of the drifts, etc., which required it, so that the mine could be inspected.

The Horsefly Hydraulic Mining Co.'s properties were fully described in the Report of this Department for 1897 and, consequently, those details will not be repeated. To summarise briefly, the property was opened in 1890 by Dan McCallum as a small hydraulic proposition, with a No. 1 giant and a 7-inch pipe. It was purchased in 1892 by the present Company, was opened up as a hydraulic pit in 1893, and was washed in 1894 and 1895, water having been brought in from Mussel creek, a distance of 12½ miles. The mine was originally opened out as a hydraulic pit and has been worked by that process. It now has a face of 800 feet in width, with a height of 100 to 150 feet. Of this old hydraulic pit little can be said, except that between 4 and 5 acres, from which were recovered about $150,000, have been washed away, leaving a bare bedrock and a high bank of cemented gravel on the south side, reaching lengthwise from one end of the pit to the other, the exposed bedrock having a gentle dip to southwards. The bedrock in the hydraulic pit consists of pale, Tertiary (Miocene or Oligocene) shales, clays, sandstones and conglomerates, only moderately indurated and, in general, easily removed by the jet whenever this is required. The general colour of the auriferous gravels is yellowish, but becomes bluish towards the base. They are directly overlain by a regular layer, of from 10 to 15 feet in thickness, of ordinary boulder-clay, which, except where covered by later gravels, forms the general surface of the country in the vicinity. The auriferous gravels at this place are, therefore, distinctly pre-glacial in age, and may, with little doubt, be assigned to the Pliocene period of the Tertiary. While it is probable that they represent an old river-channel, this has not yet been clearly demonstrated, nor is it at all certain that they have any

intimate connection with the present course of the Horsefly. The problem is one not only of great interest, but also of great importance, in connection with the future development of the field.

It soon became evident as the work progressed, to quote from Mr. H. A. Brigham, a California hydraulic expert engaged to report on the property for the Company, that this hydraulic pit was "worthless for hydraulicing, for several reasons:—

"1. Lack of sufficient grade for tailings and under-currents.

"2. The bedrock is pitching down so fast, as the interior of the hill is approached, that a slight extension of the sluices would bring them entirely above bedrock.

"3. The gravel is so much cemented that it cannot be sufficiently disintegrated, by the action of water alone, to free the gold from it.

"4. That the gold is coated to such an extent that the quicksilver will not readily amalgamate with it, without more scouring than can be obtained by ordinary hydraulicing.

"5. That much of the gold is so thin and scaly that it cannot be saved in the ordinary hydraulic sluices before being amalgamated."

The management, for these reasons, decided to abandon the hydraulic process and to work the mine as a drifting proposition, using stamps for crushing up the cemented gravel.

In many respects this gravel deposit is ideal for drifting. In the first place the bulk of the gold in the total depth of 100 to 150 feet is found in the lower few feet of the deposit and in the upper few inches of the soft bedrock, while, though the remaining portion of the deposit contains values which might pay for hydraulicing if the gravel was free, in the lower layer only are the values at all concentrated. Again, the upper limit of these richer layers is clearly marked throughout the deposit by a layer of finer sand and gravel, which serves as an indicator of the profitable zone. This zone is from 2 inches to 6 feet deep on the bedrock. The bedrock is also very soft and can be easily mined with a pick, enabling the miner to under-cut the face, as is done in coal mining, the gravel being sufficiently cemented to stand during such operation, and yet not so solid but that it can be broken down with hammer and gad.

Then, again, the gravel above the workable zone is cemented quite tight, so firmly indeed, as to enable any ordinary drive to be made without any timbering, while in breasting or stoping from the drifts, comparatively few stulls or posts are required, and the boulders and large stones from the mining operations can be piled back, forming solid walls. The surface of the bedrock, while undulating, is extremely uniform, and permits of an extensive and thoroughly systematic laying out of tunnels and gangways. The workings are practically dry and any water made can be drained off. The overburden is comparatively slight, which would admit of surface connections being easily made for ventilation or safety. The above-ground conditions are equally favourable, with a good mill-site, perfect dump, capable of any extension, and a water supply more than sufficient and under a head capable of giving all requisite power. It seems hard to imagine any set of general conditions more favourable for cheap and extensive mining than are here presented.

As to the work done and results obtained, the following is based upon the reports of the Company's engineers:—

Early in the season of 1897 the main working tunnel was started at the forks of the main sluice-cut and was run in for 500 feet in bedrock, when it broke through the rim. At 550 feet in, the surface of the bedrock was down to the track level of the tunnel, but it soon rose again and the tunnel is now entirely in bedrock. From this main tunnel chutes were raised through the bedrock into the gravels above, where stations were excavated, from which gangways were

driven at, approximately, right angles to the main tunnel, and from which, again, drifts were driven at right angles. The gravel was breasted out in the drifts and run in cars along the main gangways to the stations over the tunnels, where it was dumped into the chutes, from which it was then drawn out in larger tunnel cars to the stamp-mill or wash-house. Up to the end of 1898 the working cut and tunnel had been driven through the northerly rim of the channel for 1,200 feet, and some 5,400 feet of working gangways and drifts had been driven to explore and block out the gravel.

During the progress of opening up the mine as a drifting proposition, some 9,900 tons of gravel, soft bedrock, etc., mined in the various drifts, were put through the stamp-mill and produced $14,564.21, or about $1.46 per ton. At the same time some 1,100 tons of free gravel, etc., were put through the wash dump (a bin in which the gravel is washed with a hydraulic nozzle), and are reported as yielding $1.44 per ton. It appears from the workings and from the reports of various engineers who have examined the property that the values of the gravel are "spotted," and the management claims that, by only working certain richer portions, they are able by selection to run the grade up to $4 or $5 per ton, which would, of course, be at the expense of an increased mining cost. The cost of mining "average" gravel is put down by the manager at $1 per ton, with milling at 12 cents per ton, equal to a total of $1.12. For mining "selected" gravel—mining, $1.10 to $1.45, and milling 12 cents, or a total of from $1.22 to $1.57 per ton. Owing to the difficulty of getting a sufficient supply of skilled labour, it is reported that these mining costs have not been realised, although they should have been, under normal conditions.

The duty of a 750-lb. stamp, dropping 8 inches, 90 times per minute, on this cemented gravel is, per 24 hours, 12 tons through a $\frac{5}{16}$ round hole screen, or 15 tons through $\frac{3}{8}$-inch round hole screen. Sixty per cent. of the gold is caught in the mortar and 40 % in riffles. A 16-inch pipe delivers water under 106-foot head to a 6-foot Pelton wheel and supplies the requisite power, while for use in winter there is provided a 35-horse power engine with boiler. If the values reported by the management as average continue to be maintained (and there is no apparent reason to expect the values to decrease), this proposition should be one of the most attractive in British Columbia. Since 1899 no work, other than that of a couple of men kept chiefly as watchmen, has been done on the property. There are good bunk and boarding houses, store-house, office and quarters for manager and assistants, saw-mill, blacksmith and carpenter shops, stables and barn, all situated on a gently sloping hill. While there is nowhere the evidence of any unnecessary "frills," all the work has been well done, is substantial and suitable for the purpose intended.

Sunday, August 31st.—Detained at Horsefly on account of a sick horse, until another could be obtained from Harper's.

September 1st.—Left for Bullion with Mr. Hobson, the Indian with the pack-horse having been sent on the previous day. Mr. Hobson's Company had surveyed out and opened up from Horsefly, *via* Polley lake, a road which was originally constructed at the company's own cost, partly for the purpose of getting material into Bullion direct from the 108-Mile House, *via* Harper's. The road had been made first as a winter road, and should be well adapted for such purpose, but at present it is in no condition to sustain any heavy waggon traffic, although it is passable for passenger traffic.

The total distance is estimated at about 35 miles. The first mile of the road is down the valley of the Horsefly river, but gradually the plateau to the south of Quesnel lake is taken. About 5 or 6 miles out a belt of green timber is struck, the road continuing in this for about 10 miles. It is from this belt that practically all the timber for the Horsefly mine would have

to be obtained, as the country in the vicinity of that property has been burned over and the trees entirely destroyed. At Polley lake, about half way to Bullion, the most southerly outlier of the great water system of the celebrated Consolidated Cariboo Hydraulic Mine was met with. The waters of Polley and Bootjack lakes have been dammed sufficiently to hold back in spring all the water flowing into them, which is delivered, as required, to the mine at Bullion by a ditch 11 miles long. Bullion was reached in the evening of September the 1st.

Unquestionably much of the interest taken in later years in the placer gold of the old or high channels of the Cariboo District has been due to the action of the syndicate which brought Mr. Hobson into the country, and which was prepared to invest such large amounts of money in the plant and equipment necessary to develop the latent wealth of the old deposits of gravel. Added to this, the extended experience of Mr. Hobson, his personal enthusiasm in his work, and his profound belief in the great future of the immense gravel deposits of the vicinity, have done much to stimulate that investigation which the District so needed. Mr. Hobson has been doing pioneer work in the District and has had all the difficulties of the pioneer in any new enterprise to contend with. The writer wishes to particularly acknowledge his indebtedness to Mr. Hobson for courtesies received from him, demanding much of his time, during the days from August 29th to September 9th, spent in going over and explaining the very extensive properties held by the Companies he represents.

The Consolidated Cariboo Hydraulic Mining Co., Ltd.

This is unquestionably the most important hydraulic mining enterprise in British Columbia, and although it has been frequently described, it deserves more special notice here. The present Company was incorporated in 1897, with an authorised capital of $5,000,000, divided into 1,000,000 shares, of which 800,000 have been issued and 200,000 still remain unissued. The Directors of the Company are :—President, W. D. Matthews, Toronto ; Vice-President, H. C. Hammond ; Secretary, James L. Lovell, Toronto ; R. B. Angus, Montreal ; T. G. Shaughnessy, Montreal ; John Cassils, Montreal ; G. F. Hartt, Montreal ; E. B. Osler, Toronto ; Manager and Engineer, John B. Hobson, Bullion, B.C.

In 1892 a Syndicate, made up chiefly from the directorate of the C. P. Railway, engaged J. B. Hobson, of California, an engineer who had gained there very considerable experience and knowledge of hydraulic placer mining, to visit the Cariboo District of British Columbia. Among other properties then secured by Mr. Hobson were many of those now held by the present Company, to which have been added numerous leases both by purchase and by staking. The present Company is the result of re-organisation of previous companies, which first started operations about 1892 with a capital of $300,000, increased in 1896 to $500,000, the present Syndicate taking over these earlier companies in 1897. In the early days of placer mining on the South Fork of the Quesnel river, there were several very rich bars found in that stream. Of these bars, the one at the mouth of Dancing Bill gulch was followed up the channel of the gulch and was worked by hydraulic process in a small way for some 18 years by a Chinese company, the mine being known as the "China Pit." Mr. Hobson's investigations in '92 convinced him that Dancing Bill gulch was the outlet of an old high-run channel, which parallelled the South Fork of the Quesnel above this point for some 2 miles, and which was also cut by the Black Jack gulch, a gulch some half a mile further up-stream on which the South Fork Co. was then operating, also on a small scale. Both these last-mentioned companies had reached the limit of their water supply and the means of obtaining more when Mr. Hobson secured their properties, forming a Company with larger capital, out of which has grown the present Consolidated Cariboo Hydraulic Company.

The following description of the property of the Company is taken from Mr. Hobson's report (February, 1900) to his Directors:—

Leases.

"The Company's property is located in the Quesnel River mining region, famous for its rich shallow placers, its extensive system of ancient river channels, and its immense deposits of high-grade auriferous gravels. It is situated at Bullion, Cariboo District, British Columbia, on the southerly side of the South Fork of the Quesnel river, about four miles easterly from the town of Quesnel Forks, four miles westerly from the outlet of the great Quesnel lake, and about 190 miles by waggon road from Ashcroft on the line of the Canadian Pacific Railway. The property comprises 34 placer mining leases, aggregating 2,584 acres of land, and a block of pasture land containing 320 acres. The mining leases cover, for a distance of about 10 miles, the auriferous deposits of a system of ancient rivers.

"The ancient river now being exploited lies parallel to the course of the South Fork of the Quesnel river for a distance of about two miles, and has its outlet in Dancing Bill gulch. This channel can also be opened and successfully exploited at Black Jack gulch, about one mile east, and Drop gulch, about one and a half miles easterly from Dancing Bill gulch.

"The second ancient river covered by the Company's leases is one of stupendous proportions. The deposits of this great channel can be attacked and successfully exploited at two points, viz.:—First, at Black Jack gulch, by the extension of the main sluice tunnel that will eventually be driven to work the bottom gravel of Pit No. 2; second, by opening and exploiting a hydraulic pit in the channel outlet at the confluence of Morehead creek with the main Quesnel river.

Gravel Deposits.

"The deposits included in the Company's property vary from 400 to 600 feet in depth from surface to bottom of channel. The quantity is estimated at 500,000,000 cubic yards of high grade auriferous gravel that is available for future washing by hydraulic process. The average gold tenure is moderately estimated at 25 cents per cubic yard, and the total gold content at $100,000,000.

"The quantity of auriferous gravel under the Company's control represents about one-quarter of the whole of the auriferous gravel remaining and available for working by the hydraulic process in the hydraulic mining region of Central California. (*See* Report of Secretary of War, U. S. Engineers, 1891, Vol. II., Part V., page 3080.) The value of this quantity of auriferous gravel is estimated by the U. S. engineers, and others employed by the Government for making such estimates, at $552,665,000. The capital invested in the Central California hydraulic region above referred to, including the purchase cost of mining properties, water supply systems, hydraulic plant and other equipment, amounts to $100,000,000. (*See* Report of the Secretary of War, U. S. Engineers, 1891, Vol. II., Part V., page 2999.)

Water Supply.

"The Consolidated Cariboo Hydraulic Mining Company's water supply system, as now completed, consists of 33 miles of well-constructed canals, having a capacity for delivering at the mine 5,000 miner's inches of water under a head of 420 feet. The sources of supply are at Bootjack lake and Polley lake, about 19 miles distant, and Morehead lake, 10 miles distant from the Company's mines at Bullion. All the above-named lakes have been converted into efficient storage reservoirs by the construction of substantial dams across their outlets. These reservoirs have an aggregate capacity for storing 1,016,000,000 cubic feet of water, which is equal to 470,370 miner's inches of water. This storage supply is greatly augmented by the waters of Dancing Bill gulch and other streams tributary to the main canals between the storage reservoirs and the mines, and ensures a supply, varying with the precipitation, of from 3,000 to 5,000 miner's inches of water throughout the mining season of six to seven months.

Equipment.

"The mine equipment consists of a portable hydraulic plant of four lines of 30-inch and 22-inch rivetted steel pipes, aggregating 6,000 feet; six No. 8 hydraulic giants, with deflecting nozzles, varying from 6 to 10 inches in diameter; one steam power hoisting and pumping engine for sinking shafts for bank blasting; one fire-proof magazine for dynamite; one dynamite thawing house; one fuse-cutting and detonator-priming house in each of the hydraulic pits; one general blacksmithing shop for general forging, waggon-work and horse shoeing; one pipe-making shop, fitted with rolls and other appliances for making and repairing hydraulic pipes; and one steam power saw-mill, having a capacity for cutting daily about 4,000 feet of lumber. This mill is also supplied with a planing and matching machine, boring and framing machines, also emery wheel and grind-stones operated by steam power, the use of which appliances result in a great saving of labour and a material reduction in the cost of all wooden structures, as well as the cost of sharpening edged tools. The mine is also supplied with a complete outfit of mechanics' and mining tools and implements of all kinds, sufficient for 150 men. The mine lighting plant consists of six Wells lights of 3,000 candle power each. The telephone system includes three lines, aggregating 35 miles, with 15 instruments, which place the storekeeper and manager in direct communication with the reservoir tenders, canal tenders, saw-mill foreman, general blacksmith and foreman of the hydraulic pits. The Company's camp equipment consists of one store building for general mining supplies; one tool storehouse; one oil storehouse; one frost-proof provision storehouse; two frost-proof vegetable storehouses; one slaughter house; one meat house; one general office building; one manager's office building; one manager's residence; one residence for surgeon; one hospital building; one dining house; one barn for Company's horses, hay and feed; two stables for accommodating freighters' teams; one waggon shed; one storehouse for miscellaneous hydraulic plant and fixtures; one charcoal storehouse; one surfaced lumber shed; one foreman's cabin; one house for shift bosses, and 10 camp buildings for 120 miners and labourers.

"GOLD-SAVING APPLIANCES.—The gold-saving appliances consist of a double-extended system of sluices 7 feet wide by 4 feet deep, aggregating 2,380 feet in length. This system of sluices is paved partially with end-wood sluice blocks one foot thick, and partially with longitudinal steel riffles. Fixtures and longitudinal steel riffles are on hand for the installation of two improved undercurrents intended for the recovery of flour quicksilver, fine gold, platinum and osmiridium, that cannot be recovered in the ordinary sluices."

As regards the geological conditions surrounding this property, the following is taken from a report of the late Dr. G. M. Dawson:—

"The geological conditions, as displayed in the two pits above described, are of great interest, but in the present summary it is possible only to allude briefly to the main facts. In the old South Fork pit the section, in descending order, shows (1) ordinary boulder clay with many glacially striated stones, 60 feet, containing little or no gold. (2) Stratified sands and gravels, 120 to 130 feet, yielding gold to the amount of about five cents to the cubic yard. (3) Hard 'lower boulder clay,' with very few glacially striated stones, 30 feet; not known to contain any gold. (4) Well rounded gravels, to bedrock, 30 feet; rich in gold.

"In the 'China pit' the section exposed is as follows:—(1) Stratified gravels, seen along a portion of the top of the face only; greatest thickness, about 30 feet. These contain gold to the amount of about five cents to the cubic yard. (2) Boulder clay, about 100 feet thick, in what appears to present the axis of the old channel, but running out to nothing on each side; not known to hold any gold. (3) Rather hard, roughly stratified gravels and sands, with clayey matter; the stones well rounded and often large. Maximum thickness, about 310 feet to bedrock; minimum thickness (where the overlying boulder clay is deepest), about 200 feet, rich in gold.

"The gold content of the several deposits, as above stated, results from tests made by Mr. Hobson and communicated by him to me. The equivalency of the strata in the two pits is not quite certainly determined, but No. 1, in the 'China pit,' is believed to represent No. 2 in the 'South Fork pit,' No. 2 to represent No. 3, and No. 3 to represent No. 4, respectively. The bedrock appears to be generally a much altered and shattered greenstone (diabase?) penetrated by syenitic dykes, and including a considerable body of syenite near the 'China pit.' In regard to age, it would appear that the lower and richer deposit in each pit is pre-glacial, while the upper gravels in the 'South Fork pit' (No. 2) are certainly, and those in the 'China pit' (No. 1) probably, of inter-glacial origin."

To follow the old river channel up from the point where it is cut by the present river, the bedrock of the old channel at its deepest part is from 165 to 175 feet above the level of the present river. The bottom of this old channel is from 200 to 300 feet wide, and the rims rise at angles of about 45° to 50° to a height of some 400 feet. The width of the deposit on the surface is from 1,000 to 1,500 feet, which should give about 10,000 cubic yards of gravel to each foot advance up the channel. The old channel enters the South Fork of the Quesnel almost at right angles, that is, in a northerly direction, and when followed up for some 500 to 600 feet was found to swing sharply around to the left, that is, coming from an easterly direction, or parallel with the present river. The bottom of the channel, or bedrock, is found to rise to the eastward at a grade of about 1 per cent., indicating the flow of the old stream to have been from the east. It is probable that this old channel was the original drainage channel of the Quesnel lake area, and that the present stream has cut its way through the soft and schistose rocks parallel to the old channel. The present channel of the South Fork, from Dancing Bill gulch up to Quesnel lake, is almost entirely in a canyon, the banks of which rise at an angle of 45°. At the hydraulic pit the steep south bank of the river rises to a height of from 500 to 600 feet, where it meets the north rim of the old channel, rising as steeply to the north, and forms a narrow "razor-back" ridge, which is all that separates the old from the new channel.

A depression, now occupied by Long and Little lakes, and continued through to the lower part of Morehead creek, is occupied by another immense gravel deposit. This channel has been entirely covered by leases held by this Company. Of this second channel, Mr. Hobson says in his report of 1898:—"The 25 placer mining leases purchased during the season are situated on Long Lake creek, Little Lake creek and Morehead creek. The area of these leases is $2,112\frac{8}{10}$ acres. These leases cover the auriferous deposits of an ancient river channel of stupendous proportions, for a distance of 42,530 feet, or about 8 miles, commencing at the old Cariboo Company's line west of the South Fork reservoir and extending down to the confluence of Morehead creek with the Quesnel river."

The following tables, from data taken from the published Reports of the Company, give some idea of the magnitude of the enterprise and the amount of capital entailed in the operation of such a plant:—

Summary of Mining Operations.

	Customary Measure.	1898.	1899.	1900.	1901.	1902.
Total time run	days	129	144	172	104	66
Total quantity water used	Miner's inch.	264,881	353,056	460,878	258,250	179,520
" gravel, &c., moved	Cubic yards.	821,870	1,952,535	1,843,938	2,420,288	690,442
Av. duty of water, per miner's inch	"	3.1	5.53	4	9.37	3.86
Total value of gold recovered	Dollars	105,141	92,679	350,086	142,274	61,395
Av. yield per cubic yard of gravel, &c., washed	Cents	12.78	4.07	18 98	5.8	8.89
Total mine operating expenses of season	Dollars	96,507	131,178	151,182	139,939	106,277

In explanation of the above table, it should be said that in 1901 the quantity of gravel washed consisted of—

Top deposits from upper bench	2,417,162	cubic yards.
Gravels from lower bench	3,126	"
Total	2,420,288	"

The top layers, consisting of much lighter material, are more easily removed with a given volume of water, and contain a less amount of gold to the cubic yard, as much of this material is absolutely barren.

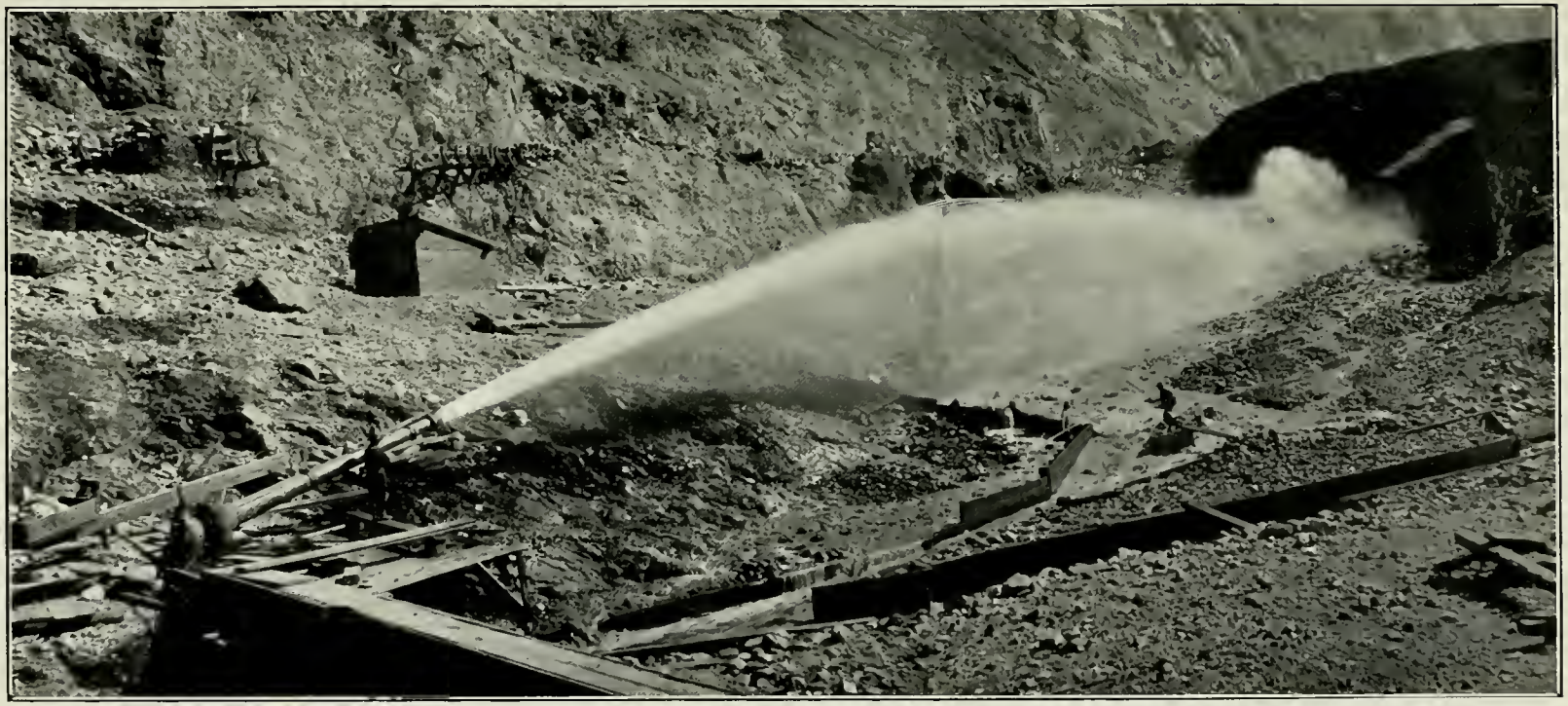
SUMMARY OF EXPENSES OF MINE OPERATIONS.

	1898.	1899.	1900.	1901.	1902.
Lands and leases—rentals	$ 432 14	$ 2,002 75	$ 2,137 50	$ 2,750 35	$ 1,858 00
Licence account, F. M. C	.....	183 40	110 00	110 00	105 00
Government royalty on bullion	1,051 41	926 79	5,567 47	2,844 47	1,277 90
Mining—labour	31,766 33	39,068 42	43,105 65	35,721 42	35,415 25
explosives and stores	20,089 90	38,837 02	33,419 03	27,946 92	21,499 25
Bank blasting, including explosives	.....	.....	7,646 87	27,313 14	5,873 43
Sluice extension and maintenance	7,047 57	6,422 11	15,918 42	10,759 45	8,573 10
Portable hydraulic plant, maintenance	2,402 15	6,461 38	5,014 14	2,593 44	4,036 90
Ditch maintenance	5,963 65	12,174 05	10,362 22	9,478 90	9,172 16
Camp and miscellaneous plant, maintenance	2,382 75	5,999 02	5,144 50	3,055 42	1,914 86
Roads and trails, maintenance	364 85	99 70	279 13	207 79	253 33
Stable, horses, harness, waggons, &c.	5,858 42	948 51	2,138 15	1,667 35	1,176 27
Travelling expenses — transportation of miners, &c	4,983 56	4,649 26	4,665 41	4,166 95	3,469 88
Bullion expenses (insurance, transportation, &c.)	2,331 40	1,491 63	4,915 33	1,945 09	900 84
Management	5,161 50	6,436 40	6,232 80	5,065 65	6,639 90
Mine office—stationery, insurance and miscellaneous	4,143 62	3,621 12	2,226 21	3,254 65	3,941 43
Tools and implements account—loss	668 93	1,009 33	845 14	92 76	77 60
Quicksilver account—loss for season	927 60	847 45	1,485 65	965 00	141 81
Total operating expenses for season	$96,506 68	$131,178 34	$151,181 72	$139,938 75	$106,276 91

In a hydraulic enterprise of this description, the output of the mine is nearly directly proportionate to the advance up the channel, that is, the number of cubic yards of gravel washed, which is again directly proportionate to the amount of water available for washing such gravel, while this is yet again nearly directly proportionate to the rainfall; hence, it may be said that for a given plant the output is directly proportionate to the rainfall.

The water to be available must be the rainfall that can be collected above the level of the ditch lines, which must be sufficiently high to give the requisite pressure at the giants in the pits; consequently the importance of a large watershed above such level. Not only has the water to be collected, but it has to be stored up or accumulated for the whole year, for use during the 5 or 6 months' working season. To give some idea of the extent over which the rainfall is collected at this mine, the area of the watershed tributary to the ditch lines is given in the Company's plans as 59.4 square miles in 1898, and this has been somewhat extended since. The capacities of the reservoirs are also given as follows:—

Polley lake	304,000,000	cubic feet of water.
Bootjack lake	162,000,000	" "
Morehead lake	550,000,000	" "
Total	1,016,000,000	" "



CONSOLIDATED CARIBOO HYDRAULIC MINING COMPANY'S 9-inch MONITOR WASHING BANK.

The cost of the Morehead dam and ditch—

Dam	$37,573 14
Ditch	69,826 26
Incidental	11,059 28
Total	$118,458 68

The length of the Morehead ditch is about 13 miles, while that from Polley lake is about 17 miles long and is capable of carrying 3,000 miner's inches of water. The cost of this latter ditch and reservoir is not given, nor is the detailed cost of the plant. The total investment, including purchase of land, leases, etc., from the former company, is set down as over $4,000,000. After all this expenditure, only barely sufficient water has been obtained to work at one place on the great area of old channels held by this Company.

From this it will be seen that in this section of the country, at least, the water rights are more essential than any lease of ground, and that the control of the water practically carries with it the control of the mines. The advance up the channel by washing has been at the rate of from 200 to 300 feet a season.

As has been already noted, the bedrock in the pit rises on a 1 % grade, while Mr. Hobson finds a 5 % grade the lowest on which he can run his sluices; consequently, 4 feet of elevation is lost for every 100 feet advanced up the channel. The present sluice, at its lower end, is as low as it is possible for it to be, consistent with a proper dump for the gravel, and at its upper end it has arrived at the elevation of the bedrock. The season of 1902 will, therefore, be the last in which bedrock can be washed by means of this sluice, although, of course, the sluice can be extended for a long distance yet and used to remove the upper benches and top burden, which form the greater part of the deposit. The lower bench lying on bedrock will have to be removed by some shorter sluice system, which Mr. Hobson proposes to make by running a tunnel from the river through the rim-rock. As has been explained, only a narrow ridge divides the ancient from the modern channels, and a tunnel started at a point on the river some 1,500 to 2,000 feet above the present sluice termination, starting at the same elevation above the river, could be run at a 5 % grade and, with a length of 1,000 feet, or possibly less, would be directly under the old channel. This tunnel would be connected with bedrock sluices, which should be sufficient to reach the bedrock at a point where the sluicing would be done through a sluice cut in Black Jack gulch. It is expected that this tunnel will be run during the coming season. The Company is provided with Gardner electric drills, which have been used with great satisfaction during the past year in the open sluice cuts and will be used in driving the tunnel.

No work was being done on Black Jack gulch, the old South Fork Company's property, nor has there been any for some years, as all the available water was required at the main pit. For the same reason, the leases extending for 8 miles to the mouth of Morehead creek remain unworked, although there is in contemplation a scheme for a second water supply system on the Quesnel Forks slope of the range and, if this is carried out, it will mean the working of the latter deposit.

September 8th.—The writer drove with Mr. Hobson to the mouth of Morehead creek, where the western terminus of the Morehead gravel deposit is shown, cut in sections by the present creek. These deposits have been prospected by small cuts and tunnels and have been carefully tested as to gold contents, with, it is claimed, results entirely satisfactory to the lessees. The values contained are such as to permit only of operating with a hydraulic plant, and are, as far as is known, not sufficiently concentrated nor high enough to permit of the deposits being worked as a drifting proposition. This immense body of gravel, lying, as it

does, in a long, low depression, is only attackable from the two extreme ends, and it is a question yet to be determined, by actual survey and exploration, how far from the points of entrance a grade suitable for hydraulicing could be kept below bedrock.

While the lower end of Morehead creek has been spoken of as the western end of the old high channel, it is to be understood that this is only the end of such deposit as it now exists, and there is evidence that either this or other channels extended across the Quesnel river and that they have been cut by the present stream, with an enrichment of the low-lying flats along the river bed. Although no regularly organised mining operations are going on here, there are a number of Chinese doing individual mining on the flats and benches, and apparently making wages, while at low water certain bars in the river are worked over in a small way.

Dredging.

This section of the river had been taken up by dredging leases, and in order to work them a large and very heavily equipped dredging plant had been brought on to the ground. The hull of the dredge is still on the ways and the machinery is still on the ground, although, it is said, some parts are missing; but the dredge has never been equipped, as the Company owning it got into financial trouble before it had been even able to make a test of the ground.

THE QUESNEL RIVER.

September 9th.—A move was made from Bullion to the "Dam" at the outlet of Quesnel lake. There is a trail from Bullion to the Dam direct, and there is also a winter road, branching off the Polley lake road, and leading to the south shore of Quesnel lake at the Dam; but as there is no means of crossing the river, except by a high plank at the dam gates, which few pack horses will take, this route is only used by foot passengers; consequently, horses have to go to Quesnel Forks and then up the north side of the stream. The distance from Bullion to the Forks is about 4 miles. The first half of the way is along the rocky base of the mountain at an elevation of some 800 feet above the river, and the last half is descending over heavy "slum" or silt beds, which overlie the gravels here to a depth of 400 or 500 feet, and which are constantly being undermined by the water, so that large mud slides are frequent.

Quesnel Forks.

Should a large slide occur near the bridge (where a small slide recently took place), there is great probability that it would divert the stream to the north and seriously endanger the town of Quesnel Forks. This town, as the name implies, is situated between the north and south forks of the Quesnel, on a low-lying gravel flat, only a few feet above water level. This flat has been much of it mined and, as a matter of fact, would be worked now but that it is plotted as a Government townsite. The gold here is not bedrock gold, but occurs on certain layers at no great depth below the surface. Quesnel Forks was an important centre in the early days, when it was on the main trail into the Barkerville district, and when placer mining was in progress up both forks of the river. Since the completion of the waggon road into Barkerville *via* Quesnel, and the exhaustion of most of the shallow placers of the District, the town has been practically abandoned by its white population, not over a dozen remaining, and the place being occupied by Chinese. When visited at the above date (September 9th, 1902) there was one hotel and bar, with a store in connection, run by John McRae, and a branch store run by George Veith, whose principal point of operation is Keithley creek. The office of the Mining Recorder of this, the Quesnel Mining Division, is still located here, while the office of the Gold Commissioner of the District is at Barkerville. There is a weekly stage and mail service to Quesnel Forks from the 150-Mile House, *via* Big lake and Bullion, the road crossing the South Fork on a bridge at the town. From Quesnel Forks there is a waggon road, very narrow and rocky, following up the north side of the South Fork to the western end of Quesnel lake.

Quesnel lake is a magnificent sheet of water, occupying a comparatively narrow valley, extending eastward for some 75 miles. It provides, at present, the easiest route from this District by which the Clearwater country can be reached, in which latter section some important prospecting work is being carried on, with much promise of success. The valley of the Quesnel below the forks is wide, and is covered with gravel deposits on the hillsides to a height of 700 to 800 feet above the present stream. In the immediate valley bottom the gravel deposits are capped with immense deposits of silt and clay. Many theories have been propounded as to the origin of these deposits, but all upon evidence so insufficient as to be unconvincing. It may be said, however, that the probabilities are that the hill deposits mark a higher and older run of gravel, whether in channels parallel to or crossing diagonally over the present valley is uncertain, and that the lower valley is of comparatively recent cutting, while its gravels are derived from the older deposits. These hill deposits have been prospected and tested at various points, at many of which gold values have been proved in quantities sufficient to be profitable if worked by hydraulicing. The deposits are of enormous extent and, if a sufficient supply of water was obtainable, there are several spots where large hydraulic mines could be profitably operated. The water supply from the immediate neighbourhood is not at a sufficient elevation, and to obtain such from the distance necessary would entail an expenditure of capital so great that it has as yet prevented these claims being worked other than in a small way. From these small workings, however, results are reported which indicate the values of the deposits to be such as to render the question of water supply worthy of investigation. On the north bank of the south fork of the Quesnel the gravel benches appear in places high above the bed of the river, and these are also worked, but at present only in a small way, for the same reason, that but a little water is to be had and that only in the spring of the year.

Rose Gulch. At Rose gulch, nearly opposite the mouth of Dancing Bill gulch, at a height of 200 to 300 feet above the river, John McRae *et al.* do some sluicing every spring, while the water of the creek lasts, and Mr. McRae reports taking out from $7,000 to $9,000, or a little more than expenses. The operations only last for a couple of months each season, and are of such an irregular nature that it is impossible to estimate the gold contents of a cubic yard of the gravel. The body of gravel here worked is regarded as a break out from an old, main channel, higher and further from the river. The property was not being worked when visited, as the water had long since given out.

The Consolidated Victoria Hydraulic Mining Co. holds certain leases near Rose gulch, and also on the opposite side of the South Fork, but has done no work here for some years.

The Golden River Quesnel Mining Co., Ltd., which built a huge dam, at a reported cost of $250,000, across the South Fork at Quesnel lake outlet, for the purpose of leaving the river dry for a time that the bed might be worked, has permanently suspended operations, and the dam, it is now learned, has been sold by the bondholders to Mr. Hobson's company.

In the earlier days very large amounts of gold were obtained from the bars in this part of the river, among which the most famous were the Dancing Bill gulch bar, French bar and Big Wheel flat. The character of the river would indicate that these bars were not formed by, nor was the gold derived from, the gravels washed down the channel of the main stream, but that they owe their origin to gravels carried down by the creeks from higher levels on the hillsides and concentrated to a certain extent; in short, they are derived from the sides of the river and not directly from up stream. From the bars in question the gravel has been traced up the hillside and creek beds to the higher channels, portions of which are now held under leases.

Sultze's Gulch.

At Sultze's gulch, about three quarters of a mile north of the Dam, at an elevation of several hundred feet above the lake, Joseph Muir has run a tunnel into the hill, which is supposed to be the south rim of the great high channel. At 200 feet in, the tunnel cuts through rim-rock into gravel, supposed to be the old channel, and has been continued into such for 16 feet. The bedrock was here found to be still dipping to the north at an angle of 20°, the channel having a run from east to west. The gravel encountered was good wash, but contained many large boulders. It could not be learned exactly what results were obtained from this gravel further than that it carried gold in appreciable quantities. The tunnel has not gained any great depth from the surface, as the creek bed is here very flat.

On a bench 300 feet above the lake there are several bench claims. On the *Sunrise*, Pat Gaffney, the owner, was found working alone and in a small way, surface stripping and cleaning up on bedrock at a depth of from 2 to 10 feet. He claims to be making from $1.50 to $2 per day. The wash seems to be more a slide of crushed slate, etc., than a regular gravel wash. The total amount of work is not great, but for one man it represents a good deal of time. The water supply is local surface water only.

The *Pride of the Lake* is a bench lease held by Robert Winkley, John McRae, —— Burrell *et al.*, situated nearly adjoining and at about the same elevation as the preceding property. Water has been brought in by a small ditch from Coquette creek, a distance of three-quarters of a mile, giving a moderate supply while the water holds in the creek. When visited, work had ceased, owing to failure of the water supply. The deposit of gravel here occurs in a basin, or rather a hollow step on the hill-side, with a trend east and west, and is an overflow from the larger channel known to exist further in the hill. The deposit contains many large rough boulders and much well-worn wash, mixed with sand, slate and clay, varying in depth from a few feet up to about 20 feet. The values per cubic yard are reported as being exceedingly good, and to be found chiefly near bedrock. In order to get sluice grade a tunnel about 100 feet long has been cut, in what might be called the lower rim-rock. This tunnel is now used as a sluice. On the top of the gold-bearing deposit there is, in certain parts, a deposit of fresh water shells, again overlaid by a bog deposit of peat. The amount of gold derived from this leasehold is comparatively small, but with the values found would appear to be worth exploiting on a larger scale and in a more systematic manner. In fact, the whole length of the hillside shows small benches of gravel, holding good values, which, if consolidated, should pay well for bringing in water from Spanish lake, which could be done at comparatively little expense.

Within the boundaries of the lease just mentioned is a claim 200 by 200 feet, held by the Ma Song Yuen Co., a Chinese partnership. This claim is regularly worked each season while the water lasts, and from it very high values are reported, although no exact data as to the amount extracted could be obtained. A deep open cut, walled up with boulders for some 200 feet, provided drainage for the pit, which is of the same character and, in fact, is excavated in part of the same deposit described as held under the preceding lease.

September 11th.—A rough winter road was followed on horseback from the Dam to Spanish creek, at the mouth of Black Bear creek. This road was cut out only to get in some machinery, has very steep grades and is almost impassable for waggons.

Coquette Creek.

Coquette creek is a small stream flowing from the north into Quesnel lake, about a mile above the Dam. Its course, for several hundred feet above lake level, is unproductive and is chiefly over slate formation, but at about the elevation mentioned it appears to have cut through very extensive gravel deposits,

which are covered by a lease held originally by the Victoria Hydraulic Mining Company, previously mentioned. This Company did considerable work here five or six years ago, but since then the property has lain idle. The Company holds an exceedingly valuable water record from Spanish lake, from which a ditch line was constructed carrying the water to the upper reaches of Coquette creek, into which it was dropped several hundred feet. This ditch line is now almost ruined by slides, etc., as it was of very cheap and temporary construction. Since abandoning the Coquette creek property, the Company is reported to have done some prospecting work on the North Fork of the Quesnel, but with what results could not be learned. The Company did no work in 1902.

Likely Gulch.

Likely gulch is a small tributary of Coquette creek, flowing in from the east, at a point about one mile from the lake. The gulch has been extensively worked by a Chinese Company, using the water flowing in the creek in the early summer and spring. The property is said to have been purchased by Mr. Hobson from the Chinese for $5,000, and it is stated that he did some work on it in 1901, building a small flume and sand-box and washing some gravel, obtaining, it is reported by one of his employees, very fair values. No work was done during 1902. Bedrock, which is here the regular slate of the district, is exposed on the north side. The wash, at the point where worked, is made up of well-worn wash gravel, mixed with fragments of bedrock and of volcanic rocks, the latter probably derived from a capping of such over the old main channel cut by the gulch, and of which the gravel so far worked is only an overflow, brought down by the action of the stream.

Spanish and Black Bear Creeks.

The road from the Dam to the workings on Spanish creek leads along the south-western end of Spanish lake, a sheet of water about 5 miles long by about 1 mile wide, lying at an elevation of some 3,000 feet above the sea. This lake is of considerable importance, as being the only natural reservoir of any size between the North and South Forks of the Quesnel river. From Spanish lake the road follows Spanish creek down as far as Black Bear creek. Just below the mouth of the latter stream there is a canyon, which prevents even a trail from following Spanish creek further.

Black Bear Creek.

On Black Bear creek, about one-fourth of a mile above its junction with Spanish, the Pioneer Mining Company (Jas. Moore, Pres., Bullion P. O., B. C.) has a shaft down 100 feet, sunk near the stream bed through a wash of slate containing pyrites and rounded boulders, in all probability a slide from the adjacent hillside. At this depth bedrock was struck, but was found to be still dipping to the south-west at an angle of 40°, that is, into the hill and away from the creek. A previous shaft, reported as 95 feet deep, had been sunk nearer the creek, and here the bedrock had the same dip, as did also the rim-rock on the east side of the creek. On bedrock Mr. Moore claims to have found as high as $1 to the pan, but little or no values in the overlying deposits. Over the shaft there is a good house, containing an overshot water-wheel, 20 feet diameter and 3 feet breast, which is fixed to operate an 8-inch Cornish pump and also a friction hoist. The ground is evidently too deep to be bottomed from this point, as the hill rises very rapidly to the south-west, so that, if this deep channel is to be reached, it will probably be by a tunnel started in below the falls on the main (Spanish) creek, a distance estimated at one-fourth of a mile.

It is reported by the old miners that gold in quantity was never found on Spanish creek above Black Bear, and from this it is argued that the old auriferous channel came from the

hills immediately to the south of Black Bear creek; certain it is that on such hills may be traced what is either an old high channel cut twice, or two old channels cut once, by the valley of this stream, and which has been tested in several places and found to carry gold in appreciable quantities.

Black Bear Placer Mine.

On the north side of Black Bear creek, about one and a half miles from the mouth, Hugh McGregor *et al.* have located the *Black Bear* placer mine and have done considerable ground-sluicing on what appears to be the opening of an old high channel into the valley of the present stream. In this the bedrock shows in places, but it was so covered by clay and slide when visited that it could not be followed.

This partnership took out some gold from here but how much could not be learned, as none of the owners were on the claim, which had not been worked in 1902.

About three-quarters of a mile further up the creek, and on the opposite side, Mr. Black and Jas. Moore had each put a tunnel of 70 feet, more or less, through slide matter in search of an old high channel, the presence of which was considered probable, as in the slide on the bank of the creek several pockets containing very heavy gold had been found. It was stated by the old miners that from above the falls occurring in the creek above the *Black Bear* placer mine, the gold increased in weight up to the point where the tunnels just mentioned were started, and that above such point little or no gold was found. These tunnels have so far been unproductive of results, but Mr. Moore is engaged this winter in extending his work further. As already noted, a fall occurs on the creek about one and half miles above the mouth. The water here descends about 100 feet in a very short distance, over schists and slates much silicified and hardened. Just at this point there is a contact of a quartz schist, full of iron pyrites, and a graphitic shale, and this contact seems to coincide with a line of heavy faulting, while fissuring has taken place along the line of the fault and has led to the formation of several quartz lenses of considerable size, and to mineralisation of the schists. These quartz lenses appear at intervals in the bed of the stream for half a mile up the creek, showing mineralisation of iron pyrites in considerable masses.

Silver Star Mineral Claim.

Just below the falls on Black Bear creek a large outcrop of such quartz appears on a very much broken bank, and Joseph Moore has located the *Silver Star* mineral claim covering it. On this quartz outcrop he has run in a tunnel for some 15 feet, and reports that he had run a similar tunnel the year previous, but that a slide had come down and removed that portion of the bluff, as was evidently the case. The quartz is here some 4 to 5 feet wide and very much shattered, the whole knoll on which it occurs being apparently a huge slide from the neighbouring hill, on which several similar quartz exposures are visible. In the quartz exposure above the tunnel there are several pockets of galena and occasional specimens of copper sulphides, as well as the iron sulphides noted elsewhere on the creek.

About a mile further up the creek, John McRae *et al.*, of Quesnel Forks, have a quartz claim staked, upon which about $100 worth of work has been done, consisting of a 5-foot tunnel and 5-foot pit. Here about 10 feet of quartz shows in the slates, with a strike to the north-east, but the continuity of the body is uncertain, as it appears to be cut off a few feet from the workings by a band of disturbed slate, and the continuation of the quartz to the south-west, on the opposite bank of the creek, could not be found, although some 100 feet further to the south-west another quartz outcrop occurs, which may be a continuation of the first.

The quartz carries mixed through it masses of iron sulphides, with occasional small isolated bodies of galena, the mineral amounting to about 2 to 3 % of the quartz. The iron sulphides, as sampled in the claims, proves to be similar to masses of sulphides found in the creek and in the placer workings. These masses of nearly pure sulphide run about 50 cents in gold to the ton.

There is no individual placer work now going on on Black Bear creek.

Spanish Creek.

Spanish creek, as already mentioned, runs through a canyon just below the mouth of Black Bear, and falls here, approximately, 250 feet in about as many yards, horizontal measurement, thence flowing with a fairly steep grade for about half a mile to the North Fork of the Quesnel. Just below the canyon, the Moore Mining Company, a mining partnership consisting of Geo. Veith, Cor. O'Neil, Hugh McGregor and Barney Cummeskey, has been at work for some years. This company holds one lease below and two above the canyon on Spanish creek, but the work is carried on entirely on the lowest of these leases. The creek here practically flows down a bedrock, which forms a rim of a deeper channel lying to the right or east of the present creek. From a point low down the creek a drainage tunnel was run in on bedrock, with only drainage grade. This tunnel is now 1,500 feet long up to the present workings. From the creek three inclines have followed the rim down as far as the drainage tunnel, and this tunnel, as the ground is very wet, is the lowest level to which the workings can be carried. The last of these inclines, the one now in use, is 225 feet long, in which distance it drops 60 feet vertical. The drainage tunnel is now about 300 feet to the south of this incline, and has held bedrock to within about 100 feet of the face, where it is then lost underfoot. An attempt was made to pick it up again by running straight with as flat a grade as possible, but so far without success, and a bend to the right will have to be made.

The bottom of this channel has not been reached, since the bedrock is still found dipping, and the width of the channel is also unknown, as no drive has been made to the east to strike the opposite rim. There is little doubt but that this old channel leads to the east of the canyon, running under a gravel hill from 300 to 400 feet high to the mouth of Black Bear creek, after which it is uncertain whether it will be found to come from the valley of Black Bear creek or that of upper Spanish creek, but probably from the former. The drainage tunnel was being advanced under great difficulties, as water was pouring out from the face and roof of the drift in such quantities as to render work very trying, while cleaning up gold in a stream of some 10 miner's inches is practically impossible. Where clearing up was possible, the tunnel is reported to have paid over two ounces to the set. The gravel in this old channel is well water-worn and flattened, carries masses of iron pyrites, white iron, pyrrhotite and galena, and seems to be an important and valuable deposit. It is being worked by only three men under very great disadvantage from water, which disadvantage would be largely obviated did their means permit of running a drift ahead sufficiently far to allow it to drain the gravel before it is mined. The drainage tunnel can not be lowered very much further, as the level of Spanish creek will not admit of it, but the chances are that under Black Bear creek the bedrock will have risen sufficiently to admit of the channel being bottomed with the present tunnel. At the head of the incline there is a dump house, in which there is an overshot wheel and hoisting drum to lift the dirt up the incline from the tunnel level. The right bank of the creek, from the Moore Company leases down to its junction with the North Fork of the Quesnel, is held under lease by the Stephenson Bros., who have started a tunnel on the fork, but at such a low level that it is flooded except at very low water. No work was being done on this lease.

There were a number of Chinese working along the edges of the creek and on the low benches, and they are reported to be making good wages. The bed of the present creek was wing-dammed in the early days, and has been completely worked out.

North Fork of the Quesnel.

September 13th.—From Black Bear creek there is no direct trail to the northward which can be followed by horses, and the animals were accordingly led through the woods to the old Victoria company's ditch, which was followed northward for about a mile, when another cut through the woods brought the party to the trail up the south bank of the North Fork of the Quesnel river known as the "Old Spanish creek trail." This south bank of the North Fork rises steeply from the river, and is chiefly rim-rock, but back from and more or less parallel with the present stream, at a higher elevation, there is an old channel of very great size. Near the pack-train bridge over the North Fork this channel has been worked by Mr. Hepburn with a hydraulic plant, but the results obtained are reported as unsatisfactory, although some gold was recovered. It is very questionable whether the gutter of this channel has been reached, and the values therein have yet to be determined. Water can be brought on here from Spanish lake at small cost. The north bank is a succession of wide gravel terraces. The old miners in the District report that the North Fork of the Quesnel only paid for about one-fourth of a mile above and for about 5 miles below the mouth of Spanish creek.

On the old trail between the bridge and the south end of Cariboo lake, the original ditch of what was the first hydraulic mining enterprise in British Columbia was pointed out. Here, in the 60's, a bank nearly opposite the mouth of Spanish creek was washed with a canvas hose and home-made nozzles.

Keithley creek was reached on the afternoon of Saturday, September 13th, the writer finding accommodation at Veith's ranch, one of the few old-time stopping places still remaining in Cariboo. The ranch is situated on a large, low-lying flat, some 300 to 400 acres in extent, formed in Cariboo lake by the detritus carried down by Keithley creek, long before any placer mining was done, as is evidenced by the forest of large trees occupying the greater portion of the ground. Similar flats or deltas have been formed by other creeks flowing into Cariboo lake, and as several of these creeks have been proved very rich in gold, there is a strong probability that these deltas will also be rich. Several enterprises have been started to test and work these deposits by dredging; as yet, however, no dredging plant has been brought into the District.

Cariboo Lake.

Cariboo lake is a long, narrow body of water, about 10 miles in length by a mile wide, running in a south-west direction, and being practically a flooded portion of Swamp river, which flows into it at its north-east end. The lake represents the lower or southern end of a low depression which extends many miles to the north, the whole length of which is occupied by alluvial wash, often underlaid by auriferous deep gravels.

At the ranch there is a general supply store, post office and hotel, all owned by Veith & Borland, and run by George Veith. From this centre some quartz prospecting was being done in the country to the north-east of the lake, and samples were seen indicating the presence of galena and iron sulphides carrying gold and silver, but, as far as can be learned, the values are too low to permit of working in so remote a section.

Goose Creek.

September 15th.—A canoe was taken from Veith's across the lake to the mouth of Goose creek, which is the only creek on the east side of Cariboo lake on which any work was in progress. Here, on the south side

RUIN OF "CARIBOO CAMERON'S" CABIN, BARKERVILLE.

VEITH'S RANCHE, KEITHLEY CREEK, CARIBOO.

of the creek, about half a mile from the lake, a mining partnership, consisting of Frank Hunter, Dr. Kissarth, John McRae and others, is drifting on an old high channel, some 30 to 40 feet above the present creek bed. Two tunnels have been run in at different levels on bedrock, connecting through the underground breasts. The ground is dry, is fairly solid, and contains a great number of large boulders in the well-worn wash. The bedrock is wavy, but fairly regular, and the south rim of the channel has not yet been reached. The gold is found chiefly on or near bedrock, and is coarse, flat and much worn. The owners report that they are making good pay. About half a mile further up the stream Messrs. Helgesen & Paquette are drifting and hydraulicing on the creek bed, having flumed the creek water overhead. The work here was started as a tunnel and was carried on as such for about 100 feet. At this distance it was broken through to the surface, which is now being operated at this point as a small hydraulic pit 20 feet deep, the tunnel being used as a drain and sluice. The creek bed is full of very large boulders, interfering seriously with cheap working of the deposit, which is some 20 feet deep, on a bedrock rising with the creek on an average grade of about 8 %, but somewhat irregular and wavy. The gravel continues into the bank on either side for 20 to 30 feet and to a height of about 20 feet above the present bed. It certainly appears as if the outlay of a moderate amount of capital would instal a small hydraulic plant, which should have a very fair chance of success, as there is plenty of water in the creek, which can be obtained under a good head and a grade of 8 % in the creek bottom for sluices. A clean-up was in progress during the writer's visit. The gold seen was heavy, flat and well-worn, and Mr. Helgesen reports that it is all found on bedrock, and that, as near as he could estimate, 320 cubic yards washed out during the summer yielded $1,500.

Keithley Creek.

Keithley was one of the famous creeks in the 60's, and a large amount of gold has been taken from it. The topography and geology of this creek, together with much data as to the old workings and claims on it, have been so fully set out in the report of Amos Bowman, and on the maps accompanying the same in the report for 1887-8 of the Canadian Geological Survey, that no further description of these matters will be given here, attention being confined to those properties worked during 1902.

On the old *Grotto* claim, on the right bank of the stream at the mouth, the old channel is found in the hillside some 70 feet above the creek, and, although worked in the early times for many years by whites, it is now being operated by a Chinese company, with, it is stated, fair success.

Two white men were prospecting a bench claim on the left bank of the creek below the Falls, but were not producing anything, and the final results of their work is unknown.

Onward Claim.

George Veith and partners, at the *Onward* claim, a short distance below 4-Mile creek, have been prospecting the south hillside, for many years, by means of small shafts and tunnels, in search of a channel or bench which they seemed satisfiede was to be found. This past summer "pay" was struck in a tunnel some 300 feet above the creek. This tunnel was in about 100 feet when bedrock was encountered rising to the north. On this, in dirt composed largely of crushed slate and schist and with angular fragments of the bedrock embedded in clay, sand and gravel, the gold was found. While the deposit cannot strictly be said to be an old channel, as it partakes more of the nature of a slide, still it is probable that the gold-bearing material is either a slide from an old channel lying above, or a slide from above replacing an old channel and covering the gold left on bedrock. There is considerable argument among those best acquainted with the creek as to whether this gold is from a continuation of the 4-Mile creek channel, or of the Anderson old high

channel seen on the opposite side of the stream. The argument, as based on the quality of the gold, would seem to indicate that it is more likely the Keithley creek channel, as would also the elevation. Whatever the origin or character of the deposit may be is of small importance, in light of the fact that very high values, up to $8 or $10 to the pan, were found, the average being quite high enough to well justify a drifting proposition, while the local conditions would indicate that, whatever be the nature of the deposit, it is of considerable length up and down the creek, its width being undetermined.

At the time of the writer's visit (September 14th) mining operations had been suspended, as Mr. Veith had all his men employed in getting out timber. A dam across the creek was to be constructed to supply water for sluicing and a wash-house built near the creek bottom, to which the dirt will be sent down a chute from the tunnel mouth above. In addition to this, a bunk and cook-house for the men at the tunnel level was nearly completed.

In order to prevent misunderstanding, it might be well to point out that the present "Onward" workings have nothing to do with the old abandoned tunnel and shaft driven by a company many years ago on bedrock of the deep channel of the creek, but are situated directly up the hill above the cabins of these former workings.

Information subsequently received from Mr. Prior, one of Mr. Veith's foremen, is to the effect that, when work was resumed, after the writer's visit, the main gravel channel was struck in the tunnel within a few feet, and that the tunnel has been continued for 300 feet up stream, the work indicating a regularly defined channel. Two shifts, of three men each, are now employed under-ground, and the weekly clean-up is about 20 ozs.

A little prospecting, principally by Chinese, was going on around the mouth of 4-Mile creek.

Just above the old *Stonewall* claim Messrs. Pierce & Freeman have a shaft driven on the west side of the creek, and are reported to be following up the high rim and part of the old *Dead Broke* channel. Two men were working, but were both absent when the property was visited, and the extent of recent operations could not be learned. These workings have several ventilating shafts and are said to drain through the old *Stonewall* workings. The hoisting shaft is operated by an overshot water wheel, raising a bucket.

On the left-hand side of the creek, just below "Chinatown," a Chinese company was working in the creek bottom with five to ten men, removing 25 feet of fine, clear, bluish clay, absolutely without gravel, but containing portions of crushed bedrock, among which it is reported that gold is found in paying quantity.

There is evidence that an old slide took place near Pierce & Freeman's claim, damming the creek, and forming this upper portion into a lake, in which was deposited the clay, etc., and that the channel was forced over the low bench bedrock to the south, which was worked as one of the richest parts of the creek in early days.

A short distance above Chinatown, on the north-east bank, J. Edwards, one of the old-time miners of the District, was found working alone and in a small way on a property held by him for many years, where he is tunnelling into what is supposed to be the outlet of an old high channel.

There was no work going on up French Snowshoe, and the creek was, consequently, not visited.

Little Snow-shoe Creek.

This is the upper and main tributary of Keithley creek, entering from the north-east The evidence of old and also of comparatively new work was plentiful, but none was found in actual progress when the creek was visited. Probably the most important work done on the

creek is the old "long tunnel," which was driven up the bed of the stream for 3,800 feet, following the irregular bedrock, and to which some 5 shafts were made connecting with the surface. The first 80 feet of deep ground was found to be very rich, and is said to have yielded 8 ounces to an 8-foot set, which was about the width of the pay. No work has been done through this tunnel for many years, and it is now abandoned.

Scott's Hydraulic.

On the left-hand side of the creek and a couple of miles up from the mouth, there is what has the appearance of being a high channel cutting into the hill in a southerly direction, with a bedrock also dipping in that direction. This was supposed to be the old channel which comes out at Edwards's claim on the main creek, but this point is rather obscure. Water had been brought on under 150 feet head, and was supplied to a monitor through a 9-inch pipe, the plant being reported to have cost $20,000, including very fair buildings, etc. Washing was continued during the season of 1899, with exactly what results is not known, but presumably they were not satisfactory, as the plant has been abandoned.

The *Golden Gate* lease, held by George Veith, Robert Barr and J. Sevewright, was worked in 1901 and part of 1902. There are a couple of shafts 1,000 feet apart, from which a level has followed up the bedrock of the creek. This partnership has taken over the *Strain* lease and is operating this as well. The values obtained from the old *Strain* shaft are reported to have been very good. For 80 feet below the shaft the pay was 7 ounces to the set, and for 100 feet above, 4 ounces to the set. This property was not being worked in September, 1902, and definite information could not be obtained.

Chinese Hydraulic.

A short distance above the last-mentioned property a Chinese company has 7 men at work ground-sluicing and piping a portion of the rim-rock, 10 feet above the present channel. The deep channel is here below the creek level. The bench referred to has already been worked for 700 to 800 feet in length, above which point it was tunnelled with two tunnels by William Adams, years ago. The schist bedrock is much disturbed and has a grade of only about 2 %. The wash contained fragments of schist, slate and volcanic rocks. The plant consists of a 7-inch pipe line from an old ditch and a 2-inch nozzle. The amount of gold being recovered could not be learned from the Chinese operators.

Haywood Hydraulic Mining Company.

This company is working an old channel of the creek which cuts through a point on the east side of the present stream for a distance of about 1,000 feet. The depth of the gravel channel is about 50 to 60 feet, while the width at the bottom is about 20 to 30 feet. Water has been brought on in ditches from the forks of the creek above, and is delivered by a 7-inch iron pipe to a monitor with a 2-inch nozzle. During the year 1902 an advance was made up the pit of about 100 feet, from which distance it was stated that $3,500 had been recovered. The grade of the sluice-boxes is very flat, being only 5 inches to a 12-foot box, or about 3½ %, which is not enough, with the water available, to carry off the boulders, and these are, consequently, piled up on the sides. The sluice is 16 inches wide, paved with 6-inch blocks. During the writer's visit the only work going on was that of improving the flume and ditch, as the water supply was too small at that season to work with.

A sample of sulphides from this claim, since received from Mr. Veith, and said to represent the waste from the sluices when cleaning up, gave, on assay, gold 5.9 oz. = $118 to the ton—but contained none of the metals of the platinum group.

Luce Placer Mine.

At the very head of Little Snowshoe, Messrs. Smith and Anderson are working the old *Luce* claim, one of the real estate claims Crown-granted many years ago. This company is also operating on a side channel of the creek which is apparently about 1,000 feet long. About 660 feet had been

worked out, leaving about 400 feet still to be worked. At the upper end of this claim the gravel wash cuts off abruptly, and is not seen again on the creek, but is supposed to cut into the hillside. Exactly where the channel does lead to, after it cuts off in the creek, is uncertain. The width of the channel is from 30 to 50 feet at the bottom, and each season an advance is made up the creek of about 50 feet. On the west side of the creek a ditch has been constructed which brings in water from both forks of the stream. The water is delivered in a tapering iron pipe to a monitor in the cut. The property is worked in a quiet way by Mr. Anderson and a couple of Chinamen, and while it is not a big claim and is not making a large amount of money, it is earning very good dividends on the capital invested. The gold in this claim is coarse, flattened and water-worn, and has every appearance of having travelled some distance, although some quartz-gold nuggets are found. This point is important, in view of the fact that immediately above the gravel deposits there are, crossing the creek, several large quartz ledges, which have been popularly supposed to be the source of the gold in this stream, which can scarcely be, however, since the gold is so worn and shows such evidence of travel.

Quartz.

There is, undoubtedly, a very great amount of quartz in this immediate neighbourhood. It is of a dull, lustreless character, usually very white, and containing through it patches of iron pyrites to the extent of from nothing up to 3 or 4 %. Such is the character of the quartz lenses occurring interbedded in the schists seen in the banks of the upper Snowshoe. The sulphides carry gold values, the concentrated sulphides giving assays of from $10 to $20 per ton. Visible free gold was reported as having been found in the quartz, but no specimens of such could be seen. Average samples taken for assay did not give values of importance.

On the *Haywood* mineral claim, held by Veith, Borland and Knight and situated about half a mile to the north of Snowshoe creek, there is a tunnel in about 175 feet, with two branches therefrom of about 15 feet each. This tunnel was started on a quartz vein or lens some 6 to 10 feet wide, lying in gray slate. The vein was followed for some 55 feet, when the tunnel was deflected to the right, being thus partly a cross-cut, and in a distance of 36 feet it cut a second and parallel body of quartz running N. 30° W., which showed a width of over 10 feet of white, dull-looking quartz, not carrying any visible sulphides, nor could any sign of free gold be detected. This face of quartz was carefully sampled and gave values:—Gold, 50c.; silver, a trace.

It appears from the report of Mr. Amos Bowman that, nearer the surface, he sampled this ledge and got $8 in gold. Mr. Haywood worked an arrastra on quartz from this deposit, but the work was unprofitable. The owners report getting, occasionally, fair values, but not sufficient to pay. The great body of quartz, associated as it is with the seeming source of the placer gold on the creek, gives them hope that the values may increase.

It has since been reported that this property has been bonded by certain American capitalists represented by Mr. Howson, that he has driven farther on this second quartz body, and that samples taken of the quartz thus exposed gave, on assay, values which justified further development.

On the summit of Yank's Peak there is an out-crop of quartz or quartzite, from 100 to 150 feet across. This was examined, but no values could be found.

Bowman reports the *Holmes* ledge, on Breakneck ridge, as containing galena, iron pyrites and zinc blende. An attempt to visit this property was made but was not successful, owing to a fall of snow rendering the trail impassable.

September 18th.—Breakneck Pass having been rendered impassable for horses by the fall of snow, the trail had to be followed back to the mouth of Little Snowshoe creek, where, from

Veith and Borland's old store, the trail to Saw-mill flat was taken. The trail was very wet and slippery, so that Littler's cabin was only reached about 8 p. m., after dark, and this tumble-down shanty had to serve as shelter for the night. At the south end of Saw-mill flat, Messrs. Page, Boursin & Co. were found prospecting certain leases with a horse-power drilling or boring machine. This partnership holds certain leases on the headwaters of Swift river, where large and promising gravel deposits have been long known to exist, but which have never been bottomed. Messrs. Page *et al.* reported that they had put three bore holes down to bedrock, which was struck at depths of 32 feet, 52 and 72 feet respectively, and in each hole gold was found, but not in quantities to indicate "pay." Prospecting with this machine will be continued next season on the lower end of the leases.

Antler Creek.

On Antler creek, at the lower end of Saw-mill flat, Mr. C. E. Carry, representing certain English capital, has been, with four or five men, running a drift up stream from the flat and sinking a prospect shaft to bedrock. Mr. Carry reported finding very encouraging values, but was at last forced to stop, being driven out by water. The same concern did some work on Nugget gulch, a tributary of Antler, tunnelling in from the creek, through a rim, to the supposed old channel of the stream, which is fairly well proven by tunnels and shafts, although it is understood that the bottom has not yet been reached. The values here are also reported as very encouraging.

The rich benches which, in the early days, yielded so largely and made Antler creek famous, have seemingly all been worked out. Various attempts have been made to reach the deep ground of this creek, notably at the *Nason* claim, but without commercial success. The *Nason* shaft was sunk through bedrock for about 70 feet, and a drift made to the channel. In breaking through, the gravel and water rushed in and flooded the works. It is said that the values found were not very encouraging, and it is also questioned if the drift reached the bottom of the channel. The plant is standing in good shape to-day, consisting of a 30-foot overshot water wheel, 4-foot breast, driving a 12-inch Cornish pump, together with hoist and saw-mill, all contained in a substantial dump-house. There seems, however, but little doubt that the old run of auriferous gravel, as seen on Upper Antler, left the present stream at the *Nason* claim, passing on through a low pass to the valley of Cunningham creek.

China Creek.

China creek is a tributary of Wolf creek, which latter is a tributary of Antler creek, flowing into it from the west, just below the *Nason* claim. On this creek, about a quarter of a mile from and some 200 feet vertically above the valley of Antler creek, B. A. Lasell & Co. have opened up a hydraulic pit, on what is regarded as the old high channel of Antler creek. The property consists of two half-mile leases. Water is brought in from upper Antler creek in a substantially built ditch line and conveyed from the pressure box to the No. 4 monitor in 16-inch rivetted iron pipes, under a head of 250 feet. The pit has only been opened up for two seasons, but has a channel about 200 feet across from rim to rim, with the schist bedrock rising with more than sluice grade up the channel, and with ample dump below. The bank is now about 50 to 60 feet high, the upper portions containing much fine silt. The values are chiefly on bedrock. The wash is well worn and contains a few large boulders, but not a sufficient number to interfere with work. The manager reports making a very fair clean-up in 1902, and as the water supply has been increased this year and the pit is well opened, expects to make good profits this coming year. This is as yet a small property, but has so many advantages, such as good grade, dump, water supply, &c., together with a sufficiency of gold, that it is one of the most promising in the district.

Travelling from Antler through the pass to Cunningham creek, the trail leads over meadows and flats underlaid by gravel deposits, which were worked in places in the earlier

days with good results, but only a small portion of this ground was touched, as there was difficulty in getting drainage, and there is now a large area of deposits here of highly probable values. This ground could be opened up by a large drainage tunnel, and it is a proposition worth serious investigation.

CUNNINGHAM CREEK.

On Cunningham creek, just below the pass or west branch, and where the main creek takes a sharp turn to the east, Messrs. Lasell & Wendle have acquired about 1½ miles of the right-hand bank, ground that was formerly held by the Menominee Co., and have been doing some prospecting of the 40-foot bank of gravel, here exposed lying on a light-coloured, slate bedrock. Water was brought in from upper Cunningham creek by a ditch, and a 7-inch pipe line was put in temporarily to clean up the hydraulic face. The work was only prospecting, but $500 was washed out, from what quantity of dirt is not known, but the prospect was considered very promising, and a plant will undoubtedly be installed this winter. There appears to be a good supply of water, and a reasonably good dump for the sluices can be had, as the creek is very rapid just below this point. There is an unusually large amount of black sand with this deposit, which was sampled and assayed for metals of the platinum group, but none could be detected.

It could not be learned that any work was going on on the lower part of Cunningham creek below the point just mentioned. Above the west branch the creek has a flat grade, estimated as averaging only about 2 % in the present bed. An old high channel is supposed to exist, and there is good pay found on the high benches. The old deep channel comes to the level of the present channel about 3 or 4 miles above the west branch, and affords here shallow diggings which are being worked now.

Mountain Bob's Claim.

Near this point, Robert Creswell, an old miner, was working alone on the right side of the creek, shovelling into sluice-boxes from a depth of 10 feet, and he claims to be making more than $6 per day while so employed. James Tinsdale was working a claim just below Creswell's, but with what results was not known.

Cunningham Creek Partnership.

This partnership consists of McGregor, Ross, Thompson, *et al.* On Cunningham creek, in the earlier days, very large quantities of gold were taken off a bar of solid bedrock, which cut across the stream just below Sharp's claim and was known as Cunningham's bar. The bedrock here was very rich, as was the rim on the left side for 150 feet up the bank. As the bedrock was followed up stream it was found to dip into a depression, or sag, which could not be drained, and in the earlier days had, consequently, to be left. To drain and tap this depression a drainage tunnel, or rather open cut, 1,100 feet long, was being driven from down stream in the bedrock. This tunnel has a grade of 2 inches in 12 feet, is 8 feet wide, and is 13 feet deep at the deepest point. The depression referred to was previously prospected by sinking a shaft to bedrock. This shaft struck on a sort of knoll at 20 feet depth, with deeper bedrock on either side. From the bottom of this shaft a drift was made up stream for 115 feet and an incline followed the dip of the bedrock down to the west for 75 feet, while another incline to the east followed the bedrock down 35 feet. The latter is reported not to have reached bottom, the probability being that there is a still deeper channel under the hill on this side of the creek. As may be noted from the preceding, the work done has been entirely of the nature of development, and yet, during the course of this work, some $2,500 was taken out, which paid running expenses, not including wages, this being a working partnership. The tunnel has been in progress for three years, and will probably be finished in the early part of 1903. As noted, the grade of the bedrock sluice is only 2 inches to the box, but

it is hoped, with the water available, to flush out all the fine material by hydraulic methods, piling up the rocks, etc. From the prospecting work done, the owners estimate the ground to run about $1.75 to the cubic yard, and the proposition appears to have a fair chance of success, which the partnership deserves for the plucky way it has backed up its ideas without assistance from capital.

A short distance below the ground of the McGregor partnership, a Chinese company, the Sam Wah Co., is working on the left side of the creek. A 30-foot bench of gravel is being washed with a small hydraulic plant, consisting of a 6-inch pipe and monitor with $1\frac{3}{4}$-inch nozzle. About half a mile of bench has been so worked, progress being made of about 50 feet each year. The gravel washed in 1902 was about 60 feet by 40 feet by 30 feet high, and is reported to have yielded $5,000. The bedrock is a light-coloured, soft slate, and is rising slowly into the hill, but does not give sufficient grade for hydraulicing and the rocks have to be handled over. Eight Chinamen were at work here.

Canadian Creek.

Messrs. Carry & Boursin have a lease on the upper part of Canadian creek, on which a shaft was previously sunk by the old Dominion Company. Over this shaft they have, this past year, erected a shaft-house and have installed a boiler etc., intending to pump out the shaft and drift next season. The shaft is reported as 60 feet deep and there is said to be good ground here.

The Slocan Cariboo Co., of which H. Windt is Superintendent, is opening up the old *Clear Grit* property as a hydraulic proposition, but the ground is not yet in shape to work. The bedrock cut has been made to reach the ground previously drifted from the old *Clear Grit* shaft. From this preliminary work some 50 ounces of gold were saved.

Waverley Hydraulic.

The Waverley Hydraulic Co., of which John Pomeroy is Foreman, was working its hydraulic pit on Grouse creek, employing 5 or 6 men for the season. This company has been at work here for over 30 years under the same management, and, while not making much money, has paid expenses. The yield of gold in 1902 was about 250 ounces. The pit is now about 1200 feet long, following up the old deep channel. At first the sluices were not on bedrock but are reported to be now. The ground previously washed had been drifted in the early days, but that further ahead in the channel is reported as untouched, and it is therefore expected that much higher returns will be obtained with even diminished expenses, so that the future of the Company is considered bright.

Slough Creek.

The operations of the Slough Creek Ltd., a company which grew out of the Incorporated Exploration Co. of B. C., are being watched with the very greatest interest by everyone interested in the future of the Barkerville district, inasmuch as this is the most advanced of several attempts which are being made to reach and work the deep channels of the District It is felt that the success or failure of this enterprise will have a very great influence on all the similar operations at present under way or about to be started. Possibly undue importance is attached to the enterprise, as the finding or not finding of "pay" is scarcely conclusive evidence as to other similar channels.

To illustrate this class of mining, the undertaking may be briefly outlined as follows:—

The valley of Slough creek, through which the modern creek flows slowly, is nearly half a mile wide. The surface deposits found in the valley are modern wash and silt, not auriferous to any great extent, except where the streams have cut the bench and high channel gravels, occurring chiefly on the hills to the south. These tributary creeks, emptying into the valley

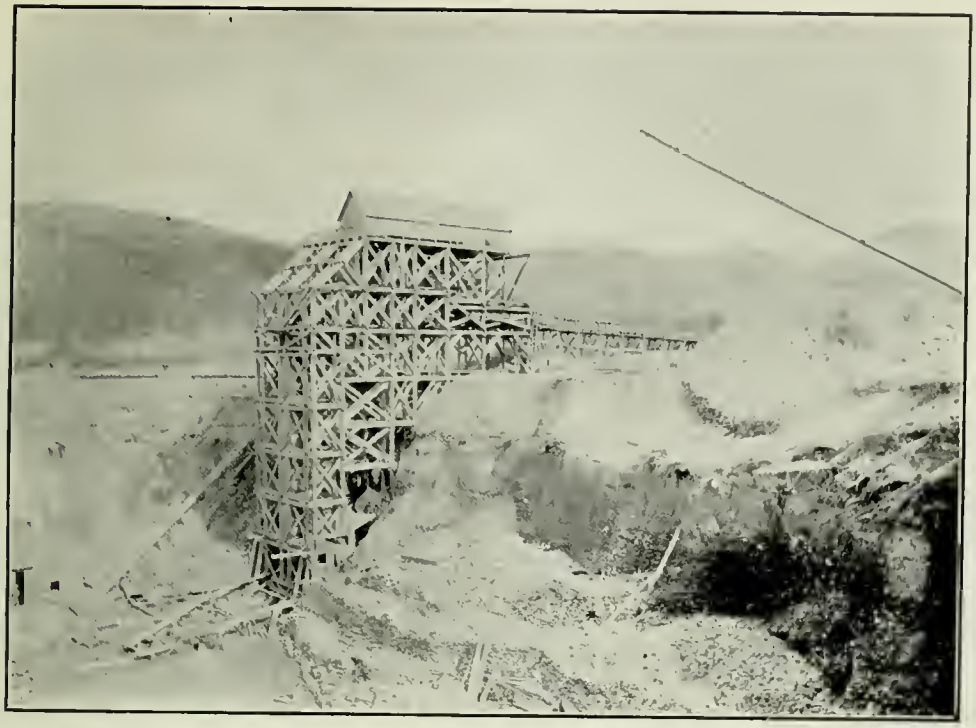
of Slough creek, have been mined and have produced very heavily. For example: Nelson creek is claimed to have produced over $3,000,000; this is probably a high estimate, but the amount was certainly very large. The gold was found in these creeks on bedrock, and as this bedrock was followed down to the main valley it dipped under all the recent deposits to a deep channel, which evidently runs under the present stream. Various attempts were made to bottom this deep channel through the surface deposits, but all such attempts failed, on account of the volume of water encountered.

A cross section of the valley was then made by putting bore holes down to bedrock at various points, by means of a hydraulic jetting machine. These holes proved the deep channel to be bounded by regular rim-rocks and to be at a depth of about 287 feet below the valley. The deep gravel channel was found to be covered with a bed of blue clay having a thickness of over 100 feet in places, and this clay bed served as an impervious covering to the old channel. It was, therefore, determined to sink a shaft in the solid bedrock on the side-hill above drainage level, and from this shaft to run a drift under the old channel, thus attacking the deposit from below and being protected from the water by the blue clay. The gravel is to be mined by drifting, hoisted up the shaft and washed in sluices. Such is, briefly, the principle upon which this work has been carried on, and, if successful, it will lead to a number of similar shafts being made.

The Slough Creek Co. has, under the management of Mr. John Hopp, sunk a shaft on the north side of Slough creek, opposite the mouth of Nelson creek, to a depth of 370 feet, of which the first 80 feet were in loose material and the remainder in solid bedrock. The shaft is 3-compartment—2 compartments 4 by 4½ feet, and one 4½ by 6½ feet. Allowing 8 feet for a dump, a drift was started south, or across the channel. This was run with a rising grade of 0.2 % for 1,070 feet. The main tunnel was driven 8 feet wide and 7 feet high in the clear, and is thoroughly timbered. A full description of the tunnel and connections is to be found in the extracts from the report of the Consulting Engineer, Mr. Thompson, as given in the report of the Gold Commissioner of the District, and need not be here repeated.

The plant consists of 4 boilers, equal to 190 h. p., an 8 by 12 Lidgerwood friction hoist, a 3-drill Ingersoll-Sargent air compressor and 2 drills, and a small horizontal engine driving a Sturtevant fan, 12¼-inch suction, used for ventilation, together with a small dynamo for lighting. The pumps referred to by Mr. Thompson are compound condensing, with Corliss valve movement; they are made by the Worthington Co. and certainly work beautifully and most economically. The shaft-house is sufficiently large and substantial to take the permanent hoisting plant, which can be put in when required. The plant is all that could possibly be desired or required, yet nothing superfluous has been indulged in and the work in and about the whole is exceptionally good and reflects credit on the management.

The writer witnessed a breaking into the old channel as described in Mr. Thompson's report, and was impressed with the necessity of proceeding with such work very cautiously, as is being done at present. The pressure of water is very great, and though not long continued after the opening is made, it seems to be almost as heavy at each new opening. The Manager, Mr. Hopp, is therefore, at present, extending the drifts and tapping the water off at several places before attempting to break into the gravel with a full-sized drift. The breaking into the channel may be regarded as an accomplished fact, and the only question now to be proved is the value of the gravels. As to the chances of this, the bore holes put down all proved that the gravel was auriferous, and such dirt as could be collected in the breaking through of the drifts is said to have yielded one ounce to the yard. The gravel is smooth, well-worn wash, and is regarded by the old miners experienced in this District as distinctly favourable. It is expected that by the spring of 1903 the drifts will be through into the channel.



MECHANICAL ELEVATOR OF CARIBOO GOLD FIELDS, BARKERVILLE.

PROVINCIAL GOVERNMENT REDUCTION WORKS, BARKERVILLE.

portion of the deep bed of Williams creek, just below Barkerville, which had been drifted 6 to 8 sets wide in former days and had paid very handsomely, being, in fact, some of the richest ground in Cariboo, and of which values enough are thought to remain to pay for working under present conditions. To this ground there is a long drainage tunnel, which served to carry off water down to bedrock, but was on too flat a grade to sluice any dirt through. Bedrock was about 100 feet deep at this point, and the present creek having been flumed over at one side, an open pit was gradually sunk thereto with the aid of hydraulic elevators, the dirt being hoisted 20 feet above surface level to give grade to the sluices. In the pit the gravel was washed by a monitor, through sluices, down to the hydraulic elevator, considerable trouble being experienced with the old timbering left in the ground from the former drifting. It was found that the hydraulic elevator would not do the work, and the repairs to the same were so great that a bucket elevator was installed and completed during the season of 1901. This elevator was fully described and illustrated in last year's Report and was run all the season of 1902. The elevator worked exceedingly well and proved the principle of so handling dirt to be perfectly sound and economical, but the wear and tear on the links and connections of the buckets was so great that by the end of the season they were worn out and will have to be completely replaced. This failure of the chain is entirely due to faulty design, or rather to using a design not suited for the work. The chain and bucket used was the Link Belt Co.'s "grit proof," which proved to be anything but "grit proof." Mr. Bailey, the engineer in charge of the work, has designed a new chain and bucket, which certainly seems to have avoided the errors in the first design and which is expected to have a reasonable life.

This past year about $16,000 worth of gold was saved, but this must not be taken as the capacity of the plant, as the pit was only being opened up. It is expected that the new elevator will be installed next season, and in 1904 a good output may be expected. The plant is really a hydraulic pit with the regulation sluices, etc., exactly as used in all such pits in Cariboo, supplemented with an elevator to elevate the tailings, the bigger rocks being separated in a pit by a grizzly, and with sluices to run off the tailings so elevated. At the head of the elevator the tailings, before going into the sluices, pass through a special gold-saving arrangement, described by Mr. Bailey as follows:—

"The buckets elevate the gravel to a vertical height of 112 feet, dumping it upon another grizzly which separates all stones over 2 inches in size. This large gravel passes into the 'coarse gravel compartment' of the main sluice flume and is carried off to the dump.

"The gravel, after passing through the 2-inch grizzly, is run into the revolving screen. This screen, 15 feet long by 60 inches in diameter, has a screening surface of woven wire cloth made of $\frac{5}{16}$-inch wire and having a $\frac{3}{8}$-inch mesh.

"The gravel is thoroughly washed in this screen by means of water jets, under a head of 470 feet, from a perforated pipe. The coarse gravel from this screen runs into the 'coarse compartment of the main sluice flume, while the fine material passes over a series of gold-saving tables laid with expanded iron over canvas and cocoanut matting, and into the 'fine department' of the main sluice flume."

According to the statement of the management, about 40 per cent. of the gold recovered was obtained above the elevator, that is, it had passed through some 14 paved sluices in the pit, and had been elevated along with the tailings. Now, as already said, these sluices in the pit are the same as those found in other hydraulic pits, and the question arises what amount of gold is lost in the tailings of these hydraulic pits. It has always been claimed that the loss of gold from the hydraulic sluices was practically negligible, but in the light of the fact just mentioned it seems desirable that the tailings of all hydraulic mines be very carefully examined.

Mount Company.

About a mile below Barkerville, on the south side of Williams creek, the Mount Company has opened up a hydraulic pit, working on a hill channel. The claim was worked first as a tunnel proposition and then by ground-sluicing for two or three seasons, and this last year is the first in which hydraulicing was attempted. There is good grade for the sluices, and there appears to be a very good face of gravel in the pit, while the values obtained are reported as very satisfactory, and a good profit over expenses was made. The lower part of the deposit, say 10 to 12 feet, is reported to carry all the gold, while 20 feet of clay and 6 feet of loose gravel above this are reported valueless. About 75 feet of the channel was worked during 1902 in 45 days' piping. The hydraulic plant consists of about 2 miles of ditching and flumes, 1,200 feet of 9-inch pipe and a No. 2 monitor.

During the fall of 1902 a reservoir was constructed, which should materially assist in working the plant and possibly extend the number of working days.

On the upper part of Williams creek the only work in progress was on the First of May Hydraulic Co.'s property. This Company, composed of Jos. Boyce, McPherson *et al.*, is opening a hydraulic pit on the left side of Williams creek, about 50 feet vertically above the bed of the main creek. This appears to be an old hill channel or a "run out" of Mink creek. The bedrock rises very rapidly, and consists of slate on edge. The wash is well worn and consists of quartz, slate, &c., with large boulders on bedrock. The plant consists of a 7-inch pipe and the smallest sized monitor. The water record comprises 300 miner's inches from Williams and Mink creeks. The plant can run from three to four months each season, and is said to have more than paid expenses this past year.

On Stouts gulch, near the summit of the pass, Messrs. Butts *et al.* have been working the Wyoming Hydraulic Mine, including a real estate and a record claim. Work was going on in two pits, each using a 7-inch pipe and No. 1 monitor. In the first pit, on Stouts gulch, the channel is about 150 feet wide and 44 feet deep, and on this an advance of 80 feet was made this past year in 6 weeks' piping, producing between 150 and 200 ounces of gold. The other pit is on Emery gulch, with a channel 100 feet wide and 50 feet deep. Some 10 men are employed here during the season, and the mine is reported to have produced over 300 ounces during the year.

Willow River Mining Co., Ltd.

This syndicate, locally known as "Laird's Company," inasmuch as, for a number of years, the enterprise has been and still is under the management of Mr. F. C. Laird, holds certain leases situated in the bed of Willow river, both above and below the mouth of Mosquito creek, which latter is the first creek flowing in from the south, just below the Meadows, near the outlet of Jack of Clubs lake. This proposition is almost the same as at Slough creek, except that the channel is not so deep. There is here a deep channel of Willow river, bounded by regular rim rocks and covered with a tightly cemented gravel, again overlaid by the deposits of the modern stream. Similarly, the heavy gold of a very rich stream, Mosquito creek, credited with a production of $3,000,000, was followed to where the bedrock broke off into the deep channel of the river, which is consequently expected to be very rich at this point.

A number of years ago, Mr. Laird attempted to sink directly from the valley, through the overlying alluvial, but the water proved too much for his pumps, etc., and this first shaft had, therefore, to be abandoned at a depth of about 50 feet. A cross section of the deep channel was made by putting down seven holes to bedrock with a hydraulic jetting machine This proved the gutter of the channel to be just over 100 feet deeper than the valley. The gravel taken from these bore-holes all contained fine gold. A tunnel starting from the valley, just above the level of the surface water, was driven to the south until it met bedrock, at

which point an upraise of 100 feet was made to the surface and a shaft sunk in bedrock to a depth below the tunnel of 110 feet. From the bottom of the shaft a drift to the north, or under the channel, was made for 485 feet, when gravel appeared in the roof. Trouble was again met with from an insufficiency of pumping power, and the mine became flooded. Heavier pumps were installed in 1897 and the work pushed forward, until a strong rush of gravel and water again buried the tunnel. From this tunnel a certain amount of gravel was recovered, which was washed and gave exceedingly high values, the amount obtained per cubic yard being so high as to spur the owners on, even in the face of numerous defeats, to reach the channel during 1902. The manager, Mr. Laird, secured two very large Cornish pumps, which he has now almost finished installing in a new shaft started in the valley in the fall of the year, and which will be sunk directly to the gutter of the channel. The pumps will be operated by a large overshot water-wheel (28 feet diameter and 7½ feet breast), and this wheel, by the aid of a "friction," will also do the hoisting.

When the writer visited the property in October the new plant was not on the ground and the shaft had not been started, but the completed plans were seen. At that date Philip Fraser, who had been foreman in the sinking of the Miocene shaft, had been engaged as superintendent, and the flume and dam for the water power had been commenced. It has since been learned that the plant has all been received, and the pumps, water-wheels, etc., installed in a large, log shaft-house, 80 feet by 40 feet wide. The shaft is being solidly and securely timbered with sawn, square timbers. It certainly appears as though this pumping plant should be sufficient to handle all the water likely to be encountered, and that the shaft should be sunk to bedrock without further delay. Judging from the progress already made, should nothing unexpected happen, the shaft ought to be completed and the drift well started by spring. There seems little doubt but that gold in very considerable quantities does exist in this deep channel, and should Mr. Laird succeed in solving the problem of reaching the same, there are several miles of this channel and several miles of a similar channel on the lower end of Williams creek which will be worked in a short time. As already said, the great difficulty here is the amount of water to be contended with; but as this is nearly certain to be confined to the wash above the cemented gravel, it should not seriously interfere with operations, once the shaft is down and the workings well started.

Mosquito Creek.

On Mosquito creek, which has been mentioned as flowing into Willow river, the Flynn Brothers partnership has been working, and practically controls all of this short creek, holding the upper portions under leases and the lower portions under a real estate claim. This partnership has been working in a small way and quietly, but is credited with making very handsome profits from its claims. The water supply is very limited and only lasts from five to six weeks, and, as the property is situated on Island mountain, it would be difficult and expensive to obtain water from elsewhere. On the *Alabama*, the real estate claim, piping was carried on for about five weeks in the deep bed of the creek, largely on ground previously drifted.

On the *Williams* claim, which has only recently been fitted up as a hydraulic pit, exceedingly good ground was struck on a bench overlooking Willow river, just above the mouth of the present Mosquito creek. This property is scarcely opened up enough yet to be economically worked, but the values found are exceedingly encouraging, and if a greater supply of water could be obtained there is little doubt that it would be a large producer. Some 15 men were employed during the short working season. The gold from this property is exceedingly pure, running over $19 per ounce. A large number of nuggets are found here, with rough quartz attached. Mr. Flynn reports finding several such pieces of gold "in place" in a small quartz vein uncovered by the washing in the pit.

It was particularly noted on Mosquito creek, as also on Dragon, Nelson and Burns creeks, that the old channels, while following the present creek beds for some distance, all turned off to the east as they neared the main valley, as though that valley then had a flow in the opposite direction to which it has now. Certain it is that the rich high benches at the mouths of all these creeks are on the up-river side.

Cornish Creek.

About 4 miles further down Willow river, Cornish creek flows in from the north, a small stream with very little flow of water and no very well marked channel. Here Fry, Clough *et al.* have erected a shaft-house, fitted up with an overshot wheel, 19 feet diameter and 4 feet breast, mounted on a 6-inch steel shaft with cast-iron flanges. This works a 6-inch Cornish pump with 6-foot stroke, and also a very effective hoist, etc. With the aid of this plant a 42-foot shaft has been sunk to solid slate rock, from the bottom of which drifts to the extent of 460 feet have been driven through loose material, which has the appearance of being slide matter with some very fine-looking gravel wash through it. Very good values are reported to have been found to the north of the shaft, but the pay streak was not continuous. It is not considered that the channel has been found as yet, and work will be continued in the hope of locating it.

On Hardscrabble creek, 2 or 3 miles below Cornish creek and on the same side of the river, the Alaska, B. C. Mining and Development Co., of Chicago, holds 8 record claims and a mile lease on Willow river. About one mile of the upper part of the creek was formerly drifted 60 feet deep. The bedrock at the lower end of the creek dropped off suddenly, by a fall, into the channel of Willow river. Below this drop a shaft, 90 feet deep, was sunk in 1899, and a considerable area of old workings now exist in connection therewith. These workings were found to be full of "dead air" and could not be entered. A drainage tunnel, 1,900 feet long, has been driven from the river level, connecting with the old workings. The pay in these old workings, and also above, is reported as exceedingly good, and there are now some 400 feet of virgin ground ahead.

The wash contains a large number of pebbles of galena, pyrite, barytes and hematite, and these heavy materials very noticeably clog up the riffles. The presence of barytes and hematite was more marked on these two last mentioned creeks than anywhere else in the District. Such gold as was seen contained a good deal of rough, scraggy gold, very little water-worn. There is a good shaft-house, equipped with an over-shot wheel, 12 feet in diameter and 5 feet face, working the hoisting, pumping and ventilating appliances. The wheel is exceedingly well made and it works beautifully.

CARIBOO CONSOLIDATED, LTD.

The Cariboo Consolidated, Ltd., M. Bailey, C. E., Manager, was operating on the upper end of Lowhee creek. The ground being worked is the deep bed of Lowhee creek, which had been previously drifted, and of this drifted ground a considerable amount still remains ahead of the present face of the pit. The manager, Mr. Bailey, reports that 150 feet of the channel, from rim to rim, was washed in 1902, representing 20,000 cubic yards of material "yielding satisfactory returns," or about expenses. An average of 15 men was employed all the season. In the early spring there is a very large flow of water to be carried by the sluices, while later in the season there is only a small flow. If a sluice big enough to carry the spring water had been constructed it would not have had a sufficient depth of water in summer to move the gravel and boulders; consequently, a two-compartment sluice was made, both compartments being used in spring and only one later in the season, a plan which seems to work very well. The sluice has a length of 1,140 feet. The water supply is derived from Stoney creek and Jack of Clubs creek, through 8 miles of ditches. This past summer surveys were made to continue this ditch system to Ella lake, with the intention of using the latter as a reservoir, into

which water would be brought from upper Lightning creek. There are two pipe lines, one 15 inches diameter, with water under a head of 160 feet, and the other 11 inches, with a 230-foot head of water.

This pit is now just about getting into good working order, the rims are better defined than lower down the creek, the ground previously drifted will soon be passed, and virgin ground will then be available. If the "pay" holds as well ahead as it has been doing, this property should make a very good clean-up within the next two years.

This same Company has been working the *Ah Quay* claim, on Lightning creek. The details of this work will be found in the report of the manager, Mr. M. Bailey, extracts from which are given in the report of Mr. Bowron, the Gold Commissioner for the Cariboo District. Mr. Bailey also states:—

"A total of 10,500 cubic yards of material was moved during the past season, the work being principally of a prospecting nature, to determine the depth and extent of the gravel. The water to work this is very limited and is brought from Last Chance creek through a ditch three-quarters of a mile in length, supplying water to a pipe-line of 15 and 11 inches diameter pipe, operating under a head of about 130 feet. The length of the sluice flume is 424 feet. The total area of this claim is 160 acres, very little of which has been worked. The daily average number of men employed from 1st of April to the 8th July has been 6. Extensive surveys were made, during the past season, of the Lightning creek claims owned by this Company, with a view to opening up the deep channel of this creek. Plans and estimates have been made for sinking a triple compartment bedrock shaft, from which a double track tunnel will be run to tap the deep ground. This work will be located about 1½ miles below Stanley. As soon as possible next spring a complete system of borings will be made to accurately determine the position and depth of the channel. The chairman of this Company, Sir J. Bevan Edwards, of London, made a careful inspection of the various properties owned by the Company last summer, with a view of deciding the future development of these claims."

Mr. Bailey stated, in March, 1903, that this work was to be gone ahead with at once, which, considering that Sir J. B. Edwards is also chairman of the Slough Creek Company, a similar undertaking, would seem to indicate that that enterprise had met with results satisfactory to the Company.

Lightning Creek.

On Lightning creek, the chief point of interest to the miners of the District this past year was the discovery of rich pay in the *Van Winkle* and *Point* claims. These claims are adjoining, in fact their workings connect, and, although owned separately, they may be considered as one and the same deposit and will be so described. The claims are situated on the right-hand side of Lightning creek, immediately above the old town of Van Winkle, and just opposite the mouth of the famous creek of that name. The shafts are sunk from a level of 4 or 5 feet above the present creek and at the base of the steep hillside along which the old Richfield road is cut.

Van Winkle.

The discovery mentioned was made in the *Van Winkle*. This claim is being worked by a partnership, of which Mr. Fred. Tregillus is secretary. Mr. Tregillus thus describes the work done:—"This is a drifting claim with five owners. The shaft was sunk, in 1901, for 41 feet in gravel, striking a top streak of pay gravel about 15 feet higher than the deep worked channel and overlying a stratum of slum. Connections were made with the old workings to furnish drainage. This gravel streak, which contained many large, washed boulders, paid irregularly for about 20 feet, when bedrock was struck on what afterwards proved to be a bench. After this, for a number of sets (8 feet cap) it paid from 6 to 9 ounces, and gradually improved until one set yielded 50¼ ounces and

another 78½ ounces, but these were exceptional, and a good deal above the average. In some places, where the ground was not very firm and faceboards were used, half a set was considered a good day's work, but where the gravel is more solid and dry, a set a shift is taken out by six men. The gold is very coarse, ranging in pieces of from ½ to 6 ounces. Opinions differ as to the source of this lead, whether it came through the *South Wales* or through the canyon, sufficient work not having yet been done to decide the point."

The amount of gold recovered from the claim is not given, but is supposed to be about $20,000.

The *Point* claim is held by A. Kelly, W. C. Fry, *et al.* It is a continuation into the hill of the *Van Winkle* and, as appeared in the workings, is slightly higher up on the bench. When visited by the writer the big pay had not been struck, but the Gold Commissioner reports (in January, 1903) that $20,000 has been recovered since the previous October, and that in one pan of dirt 56¼ ounces of gold were found. These claims both connect with the old, worked channel of Lightning creek, which was formerly drained here by a tunnel. This tunnel has, in course of time, become so clogged up that it will only carry off a certain amount of water, consequently, when an unusual flow comes from above in the creek, the workings are flooded for the time being.

The gold obtained from these claims was very coarse and heavy, with little fine gold, and is said by old miners to be coarser than that obtained from the creek in its palmy days. It is probable that this bench is on a bend of the old deep channel of the creek, although it is possible that further work may prove it to be a second deep channel parallel with the first. The importance attached to this discovery is that it shows that the "old timers" did not clear all the rich ground, and will stimulate prospecting for benches, along the famous channels, which may have very important results.

Comparative Values of Gold from Various Creeks.

It has been remarked at various times that the gold obtained from the different creeks, or even from different parts of the same creek, varied in character, appearance and value. This difference is so distinct that the old-time miners and merchants of the district have no difficulty in determining at sight from exactly what creek a sample of gold has been derived. The exactness and certainty with which this can be done is remarkable. The differences are in colour, shape, size of grains, etc., or, as they describe it, the "general appearance." These differences are not merely physical or external, but are chemical, the assays of each creek being nearly constant, but differing from that of the next. As an illustration of this fact, the following list of prices formerly paid by the Banks at Barkerville, and based upon the assay or mint returns, is appended. It will be remembered that these prices were for the dust at Barkerville prior to 1879, and only represented the net value there and then, after deducting the Bank's commission, expressage, insurance, assay and mint charges, etc. The prices show, however, the relative values of the gold dust.

Rates paid per ounce of Gold Dust by Banks at Barkerville before they closed in 1879

Antler Creek	$16 00
Conklins Gulch	15 75
Cunningham Creek	from $16 to 16 37
Canyon Creek	15 00
Forks of Quesnel	from $16 to 16 30
Grouse Creek	15 50
Harvey Creek	from $17 to 17 60
Jack of Clubs Creek	16 87

Keithley Creek	17 40
Lowhee Creek	17 30
Mosquito Creek	17 35
Omineca	from $16 to 16 25
Peters Creek	17 50
Snowshoe Creek	from $16 to 16 70
Stouts Gulch	17 12
Stevens Creek	15 15
Sugar Creek	15 70
Wilsons Gulch	17 35
Williams Creek (upper)	15 75
Williams Creek (lower)	16 12
Valley Mountain	16 40
McCallums Gulch	15 85
Cottonwood	17 00
Lightning Creek (above Spruce Co.)	17 00
Lightning Creek (below Spruce Co.)	17 55
Chisholm Creek	17 60
Nelson Creek	17 65
Davis Creek	17 60
Burns Creek (lower)	17 75
Burns Creek (upper)	17 40
Dragon Creek	17 50
Ruslon Creek	17 70
Deadwood Creek	17 60
Barrie Creek	17 60
Anderson Creek	17 60
Coulter Creek	17 60
Last Chance Creek	17 50
Quesnel River	15 75

Amalgam, $1 per ounce less than the above rates.

Dredging.

In the Cariboo District the only dredge known to have been worked during the past year was a small experimental one operated by Mr. Thos. Drummond. This dredge, of the dipper type, was built in 1899 by the Newall Dredging Co., to test certain leased ground near Quesnel Forks, but for the last couple of years it has lain idle. In the latter part of August Mr. Drummond leased the dredge and moved it 16 miles down stream, to a point on certain leaseholds which are held by him on the Quesnel river, and which extend for a distance of 10 miles above the mouth of the Beaver. The dredge was at work for about two months, and Mr. Drummond reports that the results obtained were very satisfactory, so far as proving the value of the ground is concerned.

Cobeldick Dredge.

The Cobeldick dredge was working on the Fraser river at Lytton, and, although Lytton is not in the Cariboo District, as this was the only dredge actually found in operation, it may be well to include it here. The Cobeldick Dredge No. 1 Co., with all its belongings, including the dredge itself and 5 leases of 5 miles each, was bought out by the Fraser River Gold Dredging Co., Ltd., a company formed for that purpose, and chiefly consisting of the same shareholders. The dredge machinery was made in England by Robey & Co., and the scow was made and equipped at Lytton. This dredge is of the chain bucket elevator type, with buckets of 5½ cubic feet capacity. The ladder was made of wrought iron I beams, but, although very strongly con-

structed, proved not quite stiff enough. The ladder was set at an angle of about 20°. The chain is made of steel links jointed with steel pins fitted in removable bushings, so that the wear is taken up entirely with these pins and bushings, which are easily, cheaply and quickly replaced, a marked contrast to the bucket elevator in use at Barkerville. The elevator was run at the rate of about 14 buckets to the minute, at which rate it was estimated to be raising about 2 cubic yards per minute. The dirt elevated in 24 hours was calculated at about 1,800 cubic yards. This dirt was dumped by the elevator on to a revolving iron screen, with $\frac{3}{4}$ and $\frac{5}{8}$-inch round perforations, the tailings passing out over the stern and the screenings dropping through on to gold-saving tables covered with cocoanut matting with expanded metal above. The motive power was a 150 horse-power compound engine, with two locomotive boilers. There is also a separate engine, geared direct to four drums, to handle guy ropes and lift the foot of the ladder. A 12-inch rotary pump supplies the necessary water for washing the gravel. The plant in operation consumed 6 cords of wood per day, costing $4 per cord delivered, and employed 6 men and the dredge-master.

The dredge was found, at the time of the writer's visit, at work on the right bank of the Fraser river, about three-quarters of a mile above Lytton, and was dredging a bar, not on bedrock, at a depth of from 20 to 35 feet. The dredge was in charge of Mr. F. Graham as superintendent, while Mr. W. N. Turner, an English mechanical engineer, had been sent over as managing director to investigate the working of the plant. Mr. Turner soon became convinced that the lifting of the gravel on board was the lesser difficulty he had to contend with, and that the real trouble was that they were not saving the gold contained in the gravels brought up. To test this he arranged that, at frequent and regular intervals, the dredge should be stopped and the bucket nearest the deck emptied out, and of this dirt a measured boxful was taken as a sample. These "samples" were "assayed" by a Chinaman, on the deck of the dredge, with a rocker—if not a very scientific method of assaying, certainly one of the most accurate known for such material, although the results are necessarily always low, if the work is honestly done. These tests were not completed when the writer visited the dredge, but the following is taken from the report of directors at a meeting held in London on December 30th, 1902, at which Mr. John White, the chairman, said:—

"We have an average of the tests from September 29th to the first week in December. The average comes out at 49.50 grains per cubic yard (a grain of gold is worth about 5 cents). Of course these tests vary very greatly; I find on this sheet that one comes out 21.3, the next 12.63 and another 8.91, but we never had one barren test."

This gives an idea as to the value of the ground being dredged, and there is no reason for thinking that this is an unusually rich bar or portion of the river. Mr. Turner dug a hole in the bar with the dredger and found below 9 feet of water that "the first 2 feet below gave 23.62 grains (of gold) per yard; the next 2 feet, 10.12 grains; and the next 6 feet is hardly worth working." As to working costs, the chairman said:—"At present everything over an average of 20 ounces of gold per week is profit."

These values, as given, are in the dirt actually dredged up, but Mr. Turner reported to the writer that he was not saving on the tables over 10 % of the gold so dredged up. To again quote from the director's report:—"The gold recovered amounted to £939. We know positively, instead of that representing all the gold we should have recovered, we have 'chucked' 99 % of the gold we had on board overboard."

These statements, both as to the value of the ground and the values recovered, made by a responsible engineer, after careful tests, are remarkable, and indicate the necessity of a thorough investigation of the question of gold-saving, which, when solved, will render the Fraser a very profitable field for gold dredging.

Taking into consideration the foregoing rather remarkable data as to the dredging grounds on the Fraser river, it might be well to draw particular attention to the terms and conditions of British Columbia dredging leases, as compared with those of other Colonies. The average width of the river in the vicinity of these leaseholds is 15 chains. This makes the holding 120 acres per mile of dredging lease, or 600 acres for the usual lease of five miles. Acreage is estimated as in the Australian Colonies, from which comparisons will be drawn. Dredging leases, in common with other classes of alluvial mining, are granted upon payment of a rental based upon the acreage. First, as regards rental and working conditions, those of this Province are much more favourable than in other Colonies where dredging operations are carried on. Compare the following:—

British Columbia (Circular of 28th October, 1898).

Period—20 years, with privilege of renewal at same terms.

Area—Not more than 5 miles along stream (in the cases under discussion averaging 600 acres).

Rental—$50 per mile per annum, minimum. (This has never been exceeded on the Fraser or Thompson Rivers).

Working conditions—Development work, $1,000 per mile per annum. The value of new plant and machinery employed to count as money expended.

The only Colonies whose statutes specifically dealing with this matter are available are New Zealand, New South Wales and Western Australia. The conditions obtaining, with citations of Acts, &c., follow:—

New Zealand (Mining Act, 1898).

Period—Not limited, during continuous compliance with working conditions and payment of rental. After default of payment, which is in advance, for 21 days, distraint and confiscation of plant. (Regulation 83 (2), p. 9).

Area—Not more than 1 mile along stream, nor total acreage of more than 100 acres. (Sec. 76).

Rental—1st year, 2*s.* 6*d.* per acre, say 60 cents.
2nd " 5*s.* 0*d.* " $1.25.
after 7*s.* 6*d.* " $1.85.

Working conditions—Holder of lease is required to work "continuously, with reasonable diligence and skill," (sec. 85). The Warden may require that each dredging claim shall employ up to 7 men for each dredge (sec. 86, sub.-sec. 2), but, in lieu of half the number of workmen, capital may be expended instead of such employment, at the rate of £1,000, say $5,000, for each man not employed; *see* sub-section 4, sub-sec. 1 (*d*), of sec. 85, which provides:—"The holder shall commence and prosecute the construction or acquisition of a dredge for working the claim within such time as the Warden fixes."

New South Wales (Gold and Mineral Dredging Act, 1899).

Area—Maximum of 100 acres. (Sec. 3, sub-sec. 2.)

Rental—20*s.* ($5) per acre per annum. (Sec. 11, sub-sec. 4 (*a.*)

Period—Not more than 15 years. (Sec. 3, sub-sec. 4).

Working conditions—Not less than 7 men continuously employed on each 100 acres, which number may be increased by the Warden to 10. In lieu of such employment, an expenditure of £50 (say $250) for each acre. (Sec. 3, sub-sec. 2).

Western Australia.

The following summary is taken from the Report of the Department of Mines for that Colony for 1899. It may be noted that this Act was framed in order to facilitate the exploitations of some gold deposits found in the salt lakes in the interior of that Colony, where the conditions are much more unfavourable than here, and, accordingly, is not a fair comparison. However, the particulars, so far as obtainable, are given :—

Area—Not to exceed 5,000 acres.

Rent—6*d.* per acre per annum.

Working conditions—Within one year after granting of lease machinery to the value of £3,000 for every 2,000 acres of leases is to be employed.

This, it will be noticed, seems slightly more favourable than this Province in regard to rental, but the working conditions are very similar. The rental for 600 acres in Western Australia is only $75 against $250 here, but the working conditions are an expenditure on machinery alone of $4,500 within a year, while in British Columbia the working conditions only require a total of $5,000, including both machinery and labour.

In Queensland and Victoria no difference, so far as can be discovered, is made between dredging and other mining leases. Their rates follow. In both cases continuous working is necessary or immediate forfeiture takes place.

Queensland (Statutes, p. 1568).

Period—21 years, or nearly the same as British Columbia.

Area—Not exceeding 25 acres (British Columbia averaging 600 acres).

Rental—£1 per annum per acre.

Victoria (Statutes, 1890, p. 2508).

Period—Not exceeding 15 years (British Columbia, 20 years).

Area—Not limited by the Statute.

Rental—5*s* ($1.25) per acre per annum.

To put it shortly, acre for acre, British Columbia is cheaper than any of the other Colonies mentioned. Taking the average mile acreage as 120, it makes the British Columbia rent only 41⅔cts. per annum, while the others are :—New Zealand, 1st year, 60cts. ; 2nd, $1.25 ; after, $1.85. New South Wales, $5, or more than ten times British Columbia. Queensland, the same as New South Wales ; and Victoria, $1.25 per acre.

The labour requirements, also, are more onerous than here. New South Wales, as pointed out before, for the same area would require continuous working of 42 men (which might be increased to 60) for each 5 miles. In New Zealand, *vide* section 85, sub-section 1 (*d*), to quote, "the holder shall commence and prosecute the construction or acquisition of a dredge for working the claim within such time as the Warden fixes." By regulation 81, made under the authority of the Act, it is further provided that the Warden may require not more than 7 men to be employed on each of such dredges, making a total of 42 men, the same as New South Wales. Further, the mileage of a British Columbia lease covering 5 of those of New Zealand, 5 dredges must in that Colony be immediately constructed within the area of one British Columbia lease.

Quartz Mining.

Of quartz mining in the Barkerville District it may be said there is none going on at present, if one may except certain sampling of claims being done by Mr. Seymour Baker, and noted hereinafter. There are quartz exposures to be found in numberless places, usually lying interbedded between the layers of the slate and schist, or, at least, with the same strike as the enclosing rocks. Whether these are continuous veins or lenses is in many cases doubtful, as no sufficient work has been done to settle the point; but in a large number of cases it is apparent, from the succession of outcroppings, that if not continuous veins they are, at least, a succession of lenses very clearly defined. These quartz veins are not new discoveries, but have been known for many years, and a number of them have been tested by practical mill runs. In the past there have been three or four small stamp batteries erected near Barkerville to test this quartz, but all of them are now dismantled. The Provincial Government erected a testing or "reduction works" at Barkerville, with stamp battery, cyanide plant, chlorination furnace, etc. (described later), which was in charge of an assayer and metallurgist, who made various tests of the ores of the district. The Government also assisted financially in the erection at Island mountain of a 10-stamp mill, with vanners, etc., and this mill, after running a short time, came into the possession of the Government.

From this it will be seen that the quartz veins of the District have been pretty well known and tested at various times. These tests, in the majority of instances, gave values in gold, sometimes very high, but never sufficiently so, on average samples of any large vein, to permit of work being carried on at a profit.

The quartz mines contain iron pyrites, sometimes to a large percentage, and it is generally conceded that the gold values are usually associated with these sulphides, more particularly in the larger of the quartz veins. There are a number of smaller quartz stringers in which free gold may be seen more frequently than in the larger veins. In several places gold has been recovered from the oxidized outcrops of these veins by washing the crushed ore in sluices, rockers, &c., but from such work as could be seen it is highly probable that as depth is attained the oxides will become sulphides and the gold contents cease to be "free."

On the top of Island mountain an old coloured miner named Wright is credited with washing out with a rocker over $800 from the oxidized surface ores found there. On Burns mountain there are several outcrops of quartz, carrying oxidized iron, which have been mined in a small way and produced free gold. In most of these cases the gold is very fine, and was probably derived from the weathering of iron pyrites; yet from these very deposits the writer has seen rough pieces of gold of considerable size, which evidently occurred as free gold in the quartz and were not derived from the sulphides.

As already noted, Mr. Flynn found very fair-sized pieces of gold in place in a small quartz ledge on his claims on Mosquito creek and in the *Pinkerton* claim, on upper Lowhee creek, free gold does exist in connection with sulphides. It is, therefore, probable that, while the greater amount of gold in these ledges is in the sulphides, yet some proportion of the total contents exists as free gold.

In the early operations of milling the quartz no attempt was made to save anything but free gold, and concentrates were neglected. In the Island Mountain Quartz Mill, however, vanners were subsequently put in, but, if common report may be relied on, no very careful work was done with them. The slight attention formerly paid to the concentrates has induced several attempts to be made to sample the ledges again, under the belief that the former tests, in thus neglecting the concentrates, missed the chief value of the deposits. The latest of these attempts was made this past summer by Mr. Seymour Baker and Mr. Atkins, who leased the

Government Reduction Works. These gentlemen obtained bonds on many of the existing quartz claims, staked a number of the abandoned claims, and crushed at the reduction works 10 tons of ore from the *Pinkerton* ledge, on upper Lowhee creek, besides another 10 tons from the *Perkins* claim, saving what was possible on the plates and impounding the tailings, which were subsequently treated by cyanide process. While the exact results obtained are private, it may be said that they are sufficiently high to induce further tests on a more extended scale.

On the *Proserpine* ledge, the 97-foot shaft was pumped out and sampled from top to bottom, giving, on assay, an average of about $8 in gold per ton.

The *Forrest* reef was sampled and gave good assay results, while a sample taken of the dump gave very high values.

Mr. Baker considers the result of his present operations as strictly private, and further figures cannot be given. It may be said, however, that Mr. Baker has been granted an extension of his lease of the Government Reduction Works, and he has also applied for a lease of the Island Mountain quartz mill, which latter, it is understood, will be used to test ores from the vicinity.

Mr. Amos Bowman, in his report (Geological Survey, 1887), gives a detailed list of all the quartz veins then known to exist, and as since that time no important discoveries have been made, it will not be necessary to attempt to enumerate all the quartz exposures which have been tested. The writer visited a number of the old claims, but found that most of them had been abandoned for so long that they were not in a condition to be seen or sampled without a considerable expenditure of time and money. Amongst the claims visited was :—

Black Jack.

The *Black Jack* ledge, situated on the right bank of Williams creek, just above the town of Barkerville. Here the old workings were mostly filled with water, and, having been scantily timbered, were falling in. There is a long open cut 15 to 20 feet deep, ending in a short tunnel, and from this there is reported to have been a shaft sunk, which could not, however, be seen, owing to water. The discovery was made in washing the old creek channel, which here diverges from the present creek and cuts through a point of land. The schists here are considerably distorted and somewhat shattered, and there were evidently a number of lenses of quartz, varying from 4 to 5 feet across by 20 to 50 feet long down to small stringers, usually interbedded, with a strike S. 65° E., but, owing to the shattered zone, accompanied with cross veins and general silicification of the country rock. To the east the larger quartz lens seemed to have split up into stringers, but the schist still carried some values. The main pay chute, which was followed down, is said to have faulted with depth and had not been picked up again. Although the quartz in this exposure seemed to be limited in quantity, an extension of the shattered zone could be seen in the west bank of the creek, and is probably more or less continuous. The property is now abandoned, but was at one time worked by an incorporated company of local men, who mined quite a lot of quartz from these workings. At first the ore was treated in a small stamp-mill operated by an over-shot water-wheel, but latterly it was hauled by teams to the reduction works, to be treated by cyanide process. It was learned from one of the former officers of the company that about $7,000 in gold were recovered from the ore treated. No definite reasons could be obtained for the abandonment of the property, but from what could be learned it was more occasioned by the non-continuancy of the quartz than by the low values.

The *Steadman* ledge, on the right bank of Williams creek, just above Richfield Courthouse, was one of the well-known quartz ledges of the district, but little or no work has been done on it for many years, and, though it has been staked, it is not even located as a mineral

claim now. There is here a well-defined quartz vein about 6 feet wide, having a strike S. 70° E., and dipping nearly vertically, apparently following the strike but not the dip of the enclosing schist. The walls are well marked by a good clay gouge, one wall showing from 2 to 3 inches of solid iron sulphides, while through the length of the vein there is a 6-inch streak of red spar. This ledge was also exposed by the placer mining done in the creek.

Mr. John Pomeroy, who went with the writer to the ledge, reports that a shaft was sunk from 40 to 50 feet deep, but had now caved in, and that at the depth mentioned the iron sulphides were nearly as wide as the shaft and very soft. The ore was crushed in a small 5-stamp mill and a small gold brick was obtained, but the property never paid. A sample of these iron sulphides was taken from an open cut on the surface and assayed, giving results of $20 in gold on average samples, so that it would appear that there is here a strong, true vein, but having low values.

Stouts Gulch Ledge.

At the head of Stouts gulch there is a very strong quartz exposure, which is claimed to be on an extension of the *Steadman* ledge.

The B. C. Milling and Mining Co., of which Mr. Redfern, of Victoria, is president, owns three claims at the head of Stouts gulch, almost on the divide between the latter and Lowhee creek. There has been a very considerable amount of work done here, just how much could not be seen, since the workings below the tunnel were flooded, as was also the tunnel itself, to a depth of almost a foot near the outlet. Very little, therefore, can be said from personal inspection of the underground workings.

Mr. B. A. Lasell, of Barkerville, was mine superintendent here during the last work carried on, and from him much of the following information was derived :—

The quartz at the shaft is from 25 to 30 feet wide, with a strike S. 60° W., and dip about 80° to south, and it appears to be an interbedded vein in slate or schist. There is an incline and shaft down 170 feet, intersected at 110 feet down by an adit level. At this level drifts along the vein were made, that easterly, or towards Williams creek, being about 75 feet long, with a cross-cut, while that to the west was about 140 feet long with two cross-cuts, while at a distance of about 130 feet in a winze was down 18 feet. Opposite the first cross-cut a bore-hole was put down from the drift for 97 feet, and drill-holes were also put down from the surface, one at a point 500 feet east of the shaft for 130 feet, and another at 600 feet to the west of the shaft for 143 feet. All of these proved the continuity of the quartz and, according to Mr. Lasell, also showed that the values varied in different parts of the length of the vein, and that the shaft had been sunk near the eastern limit of "pay ore"; that is to say, that the vein to the east was poorer, while from the shaft westward the values increased. In the winze from the drift average samples assayed as high as $37, while in the western bore-hole good values were also found. This would seem to indicate that "pay chutes" are liable to occur in these veins, and that even though the past workings of many of the large ledges has not proved up paying ore, yet that further prospecting may discover chutes amply large and rich enough to be profitably worked. As a matter of common experience such is usually the case, namely, that in the best of the paying veins only portions of the leads are workable.

The work of which Mr. Lasell had charge was done by a Mr. Dumarais (representing French capital), who had the property under bond, it is reported, for $75,000. The rock was hauled to the Government Reduction Works and there treated, very small values being saved on the plates, though very good results were obtained by cyanide on test lots of 10 tons. The reason why this French syndicate dropped the bond is not exactly known, but is reported to have been largely of a personal nature. This quartz ledge is certainly the largest, strongest and best defined noted in the Barkerville district, and its future will have a great influence on

that of the other quartz propositions of the vicinity. The quartz is estimated to contain about 5 per cent. of sulphides which are said to have assayed about $20 to $25 to the ton, with not over $1 to $1.50 per ton in free gold as saved by mill tests.

All the machinery for a 20-stamp mill, pans, settlers, three engines, etc., costing $61,000, was brought in about 15 years ago. This plant was never erected, but has been since stored away in a large log building near the mill-site then selected, about half a mile from the shaft. What condition this machinery is in could not be learned, as the building was locked up.

Pinkerton Ledge.

On Lowhee creek a couple of quartz ledges occur, from which exceedingly high assays have been had, and in which a very considerable amount of free gold is sometimes visible. Mr. Seymour Baker has this property under bond and was doing a little work on it, practically sampling it, with results not obtainable for publication. As far as the quartz exposures could be seen on the surface, they appeared to be lenses which in a very short distance ran into stringers. Mr. Baker, however, reports later that underground the quartz is more permanent and regular.

Island Mountain.

Island mountain is so called on account of the fact that it is practically surrounded by water at its base, which is triangular in shape, Willow river flowing on one side, Slough creek on another, and Jack of Clubs lake lying on the remaining side. On this mountain there are several quartz veins, all of considerable continuity and all carrying iron sulphides with certain values in gold.

John's Ledge.

The best known of the ledges mentioned is that owned by the Island Mountain Mining Company. This Company holds three Crown-granted mineral claims. On this property three tunnels have been driven. The middle tunnel is in about 200 feet, with several cross-cuts, and follows a very irregular quartz vein, but with one good wall, in a direction about S. 45° W. This vein is really a succession of interbedded lenses, having a width of about 3 feet and connected by a series of stringers.

Another tunnel, 25 feet higher vertically and 100 feet to the west, also follows the vein for about 150 feet, with a cross-cut to the left. In this working the vein appears to split, and is cut off for a distance, but is again in sight at the end of the tunnel. In the cross-cut the vein appears to carry nearly 20 % of sulphides, and the face of the tunnel about 5 %; and as the gold is largely contained in the sulphides, the values will vary in the same manner. No work has been done here for 8 or 10 years, but a number of tons of ore from these tunnels were treated in the Company's mill at the foot of the mountain, and are reported to have yielded between $2 and $4 per ton in gold.

The *Little Giant* mineral claim is about 300 feet above and overlooking Jack of Clubs lake, and on the same hill as the previously mentioned ledge. In an open cut there is a 3-foot quartz vein, showing no mineralisation and occurring in an altered mica schist, apparently interbedded, and with a strike S. 60° W. This showing was followed in by a tunnel, now caved near the mouth so that it could not be examined, but reported as 100 feet long and with the vein narrowing very much, but with sulphides coming in in a very considerable percentage.

Some little distance below this last was the main tunnel. This tunnel started on a stringer of quartz 9 inches wide, which gradually widened to nearly 3 feet, and this quartz was followed in for 100 feet, at which point it cut off. The tunnel was continued for 500 feet further into the mountain, without again striking the vein. This last-mentioned tunnel is connected directly with the stamp mill by a horse tramway, 1,000 feet long.

Stamp Mill.

Near the outlet of Jack of Clubs lake, on Island mountain, and just above the stage road, the Company erected in 1878 a 10-stamp mill, to treat the ores of its properties. For this enterprise the Company was loaned a

certain amount of money by the Provincial Government on what was practically a mortgage, and the mill property has now become the property of the Government. The mill, situated on the side-hill, is in a well constructed mill-house, with bins, etc., and is reached by a waggon road connecting with the claims higher up the mountain. The plant consists of:—One Blake crusher, 11-inch opening, grizzly, and bins; one 10-stamp mill, made by Prescott, Scott & Co., of San Francisco, in 1878, in very good repair, well framed and set up and fed by two "Challenge" automatic feeders; and four "Triumph" vanners, 4-foot bed, by Joshua Hendy, San Francisco, of which two are in perfect condition and two have been damaged by a falling roof. The belts are a little hard and would require to be renewed. The motive power is supplied from a single engine, 30" x 12" cylinder, with a 14-foot fly-wheel and split wood driving pulley, connecting with a counter shaft from which the power was distributed by four pulleys. The steam was provided by two tubular boilers 4 feet diameter, 12 feet long, set in brickwork and connected with a common steam drum. The mill has been well constructed and is in very good repair, having only been run for about one month.

Mystery and Little Chief Mineral Claims.

On Island mountain, about 600 to 800 feet above Willow river and two miles west of the mouth of Mosquito creek, Allan McKinnon was working on two quartz locations, the *Mystery* and *Little Chief*. Many years ago a tunnel had been driven here into the hill for 60 feet, at which point it cross-cut a quartz ledge about 12 feet wide. This vein was of dull looking, white quartz, not showing any visible sulphides, but, as sampled by Mr. McKinnon, assaying $3 per ton in gold. The claim on which this old tunnel was run had been abandoned for some years.

About 50 feet vertically above the old tunnel and to one side of it, Mr. McKinnon has sunk a shaft 50 feet deep on and dipping with a vein of quartz. The shaft, for the first 35 feet, is at an angle of 75°, the last 15 feet being almost vertical. The vein followed is about 12 feet wide, of white quartz, and where cross-cut shows that whereas the portion nearest the hanging-wall contains very low values, in that portion next the foot-wall they are very fair. There is undoubtedly a body of quartz here of considerable extent, and the returns so far obtained by Mr. McKinnon encourage him to expect that he may strike on a chute carrying good values.

Mr. McKinnon had started a tunnel lower down the hill and writes, under date of 24th March, 1903, saying he was then in 94 feet. At this distance in he took a sample of the vein at the contact with the slates, which he forwarded to this Department for examination, and this sample contains particles of metallic tin, which can readily be separated by panning. Mr. McKinnon has been requested to verify this sample, as no other occurrence of metallic tin has been known in British Columbia.

Government Assay Office at Barkerville.

The Provincial Government maintained an assay office and an assayer at Barkerville from 1868 to 1884. The gold dust was received, weighed, melted, and assayed, and the bars stamped with the Government seal, together with the weight and assay. The office is situated in a building in the centre of Barkerville, but is not at present in use. The materials and apparatus in the office are as given below.

Inventory of Government Assay Office, Barkerville, 1902.

Safe, small fire-proof, in good order.

1 bullion scales (Johnson & Mathey) in fair order, knife-edges rusting; set of weights up to 1,000 oz.; 2 sets weights up to 1,000 grammes.

1 pulp balance—bad order.

SHAFT HOUSE, SLOUGH CREEK MINING COMPANY.

DRAGON CREEK HYDRAULIC MINING COMPANY'S PIT.

1 8-inch beam (Ladd & Oertlinger) gold button balance, agate bearings, etc.—good order.
2 sets platinum weights in case, complete.
1 set bullion button weights in ivory box.
1 silver button balance—fair order.
Furniture: 2 chairs, counter, desks, stove.
Reagents, in packages and bottles—of no value.
1 set 4-inch steel cornet rolls—good order.
1 Taylor hand rock crusher—good order.
1 bucking board and muller; anvil; plumbago crucibles, etc.
2 crucible furnaces (charcoal or coke-burning) of stone, with iron fittings—not in order.
Glassware, value of $10.

The Government Reduction Works.

These works were erected by the Provincial Government about the year 1877, for the purpose of encouraging prospecting for quartz mines by offering facilities for testing the ores within the District. The works were in charge of a metallurgist and assayer, who treated the various ores that were brought in.

The *Chlorination Building* is 52 feet wide by 60 feet long, and contains a double, sloping-hearth chlorination furnace, each bed 9 feet wide and 50 feet long, with 6 stirring doors on either side. The fire-boxes are arranged for firing with wood. The furnace, which is connected with a brick dust chamber and square stack, is built of red brick, with fire-brick lining and arch. The buckstays are cast iron and the tie-rods $\frac{3}{4}$-inch round iron rods. Above the arch are hoppers for top-charging. The furnace appears to have been little used and is in fair condition.

In the *Stamp Mill* the motive power is an 8 by 16-inch horizontal engine with 2-inch governor, in very good running order. The boiler, which is in a brick setting, has been allowed to rust, so that it is of doubtful value. The crushing plant is a No. 2 Kendall's single stamp, with triple discharge and amalgamated copper plate, so arranged that the feeding platform is on a line with the road, while the discharge from the plate delivers into 2 settling tanks, 14 feet by 6 feet 6 inches by 3 feet deep, for empounding the tailings.

At the lower level are 2 round wooden leaching tanks, 9 feet diameter by 3 feet deep, with 6 round tanks, 5 feet diameter and 4 feet 6 inches deep, used for dissolving cyanide and holding stock solutions, and an 8-compartment zinc precipitating box. Coupled with the engine is an air pump and iron egg, used for circulating solutions. For concentration tests there is a V settler and sizer, and a Frue Vanner, 4 by 12-foot bed. The whole is in fair condition, and is capable of being used to make working tests. This plant was leased this past year to Mr. Seymour Baker, who used it for testing certain ores by mill runs.

CARIBOO AND QUESNEL MINING DIVISIONS.

Report by John Bowron, Gold Commissioner.*

In submitting my annual report on the mining industry of this District, I have the honour to say that the season has been a fairly prosperous one, and in taking a comprehensive review of the past history and present condition of Cariboo we find ample grounds upon which to base a most favourable impression as to its future possibilities as a placer mining

* *See* also Report of Provincial Mineralogist on this District, pp. 59-113.

camp; not so much from the past season's actual gold production as from the number and importance of recent discoveries, and the numerous promising enterprises in an advanced state of development.

It is a well-known fact that the principal part of the gold now produced in the District is won from the working of the hydraulic mines, and it is also equally well known that from their great altitude they are dependent for their water supply, in a large measure, upon the melting snow from the mountains; consequently, when I say that the snowfall during the winter of 1901-2 in these mountains was less perhaps than ever before known, it will be readily understood that the product of the mines has necessarily been less than it would have been under normal weather conditions. Taking the Consolidated Cariboo Mine for an example, it will be seen from Mr. Hobson's report that his Company was able to pipe less than one-half the usual number of days; and very much the same may be said in regard to many of our most productive mines.

As heretofore, in order to obtain more definite and reliable knowledge, I addressed circular letters to the managers and foremen of the principal mines, requesting information in regard to the season's operations, to which I received a general response, and from which the following intelligence is chiefly derived.

Horsefly.

The reported discovery last season of rich placers on the Upper Horsefly river has not so far proved of any importance; nevertheless, the prospecting and explorations done have resulted in the discovery of large quartz ledges, carrying free-milling ore, and although from tests so far made these deposits have not proven to be of a sufficiently high-grade character to be profitably treated under present conditions, with railway communication, and its concomitant advantages, it is probable that they will become of considerable importance.

Miocene Gravel Mining Company.

R. H. Campbell, Manager.

It will be remembered that a statement was made in my last report that this Company had succeeded in sinking a shaft, principally through gravel, to the great depth of 550 feet, and had obtained some excellent prospects, but was driven out by water. I regret to say that the Company has done absolutely nothing this season to further prove the value of its property, some friction having occurred between it and pre-emptors of land (under the Land Act) which partly covers the mining property. The manager has refused to proceed further with his work until the surface rights are defined.

The Horsefly Gold Mining Company, Limited.

R. T. Ward, Manager.

Regarding this mine, Mr. Ward writes me as follows:—"The early part of this season was devoted to sinking and placing elevators, to building a flume and opening up our pit preparatory to mining, so that not until July did we take out expenses; since then we have taken out $13,000, which amount will about cover the expenses of actual operations at the mine for the whole season. To get this amount of gold we have worked less than 13,000 cubic yards of gravel. Our gravel, as you are aware, is very hard to pipe, but washes freely; we find it necessary to loosen the bank with powder, and even then the quantity actually handled is small compared with the amount of water we are using (2,000 miner's inches, under 350 feet pressure).

"It is our intention to put down one and probably two prospect shafts this winter on other parts of our ground, and on the result of this work we shall determine what new plant

to put on the property next summer. One thing is certain, we shall have to get a means of handling more gravel, and also of working to a greater depth than by our present system, to make the mine productive.

"We have been elevating this season 52 feet 6 inches perpendicular, using in the elevator, for lifting purposes 1,300 miner's inches of water, and for piping purposes 600 inches; this, as well as the seepage water from the river, has to be hoisted to the surface.

"As to future operations, I have in view an improved steam shovel to work in a track in the bottom of the pit, using a belt conveyer to carry the material to the surface, where the gravel would be washed. We employ about 30 white men, at a rate of wages of from $3.25 to $5 per day."

The Horsefly Hydraulic Mining Company, Limited, has done little during the season to prove the value of the cemented gravel encountered in its mine, and which was referred to in my previous report.

The Consolidated Cariboo Hydraulic Mining Company, Limited.

J. B. Hobson, Manager.

As intimated, this most prolific gold mine has been greatly retarded in its operations this season in consequence of its limited water supply. Mr. Hobson sends me the following brief but comprehensive information in regard to this mine:—

"The light snowfall and precipitation during the previous winter, and the unfavourable weather conditions under which the snow went off in the spring, left the Company with the shortest water supply it has had since the opening of the property in 1894. During the progress of the season's operations washing was carried on 65 days 15 hours, with 2,500 miner's inches of water. The gold product for the season's operations was $61,395.19, making the total product for the mine, since the commencement of equipment of the property in 1894 to date, amount to $1,082,155.69, all of which was included in the large expenditure for bringing on water supply and the equipment and opening of the Company's mine. During the progress of last season's operations an electric light and electrically operated power drill plant were installed, at a cost of $26,815.95; and a boarding-house, store and permanent camp buildings to accommodate the Company's business were erected at Ballion, at a cost of $23,561.06. The future product of the property will depend entirely upon the water supply afforded by each season, as will be shown by reference to the result of the operations of the past three seasons, which are as follows:—

No. of days washing.	Quantity water used.	Product.
1900—171 days 13½ hours	460,878 miner's inches	$350,085 77
1901—104 " 1½ "	258,250 "	142,273 51
1902— 65 " 15 "	179,520 "	61,395 19

"During the past season's operations (season of 1902) the following explosives, miscellaneous mining supplies, provisions, etc., were used at the Company's mine:—

Explosives	139,580 lbs.
Miscellaneous provisions and mining supplies	200,293 "
Hay and oats	120,000 "
Vegetables	63,000 "
Beef, mutton and pork	30,000 "
Total	552,873 "

"The average number of men employed during the last season was 150 miners and mechanics."

Keithley Creek.

On Keithley creek Messrs. Veith and Borland have developed a most important find in their *Onward* claim, and are preparing to work their property on a more comprehensive scale than heretofore. As much as $5 to the pan has been frequently obtained on the bedrock. This discovery is the more important as being found in the hill 200 feet higher than the old channel in the present creek, and nearly 1,000 feet from it, which goes to prove the theory of the existence in this District of valuable auriferous channels in the hills, at greater altitudes than the present creek channels.

THE CARIBOO GOLD FIELDS, LIMITED.

W. Thompson, M. E., Consulting Engineer; M. Bailey, C. E. and M. E., Manager.

Williams Creek.

The problem of successfully operating this valuable mine has at last, it is believed, been solved, and I much regret not having, as yet, received a reply to my circular letter dated the 3rd October last, requesting a report on the year's operations. Mr. Thompson, who had promised to furnish the information desired, left for England shortly after receiving my letter, and has up to this date failed to communicate with me. I can say, however, that under the new system inaugurated last season of using bucket elevators to raise the gravel from the bedrock to the flume, 20 feet above the surface of the ground, being sufficient to create a dump for the sluices and a total height of 115 feet from bedrock, a large area of the latter has been uncovered, and this mine has at last become a material producer of gold.

THE MOUNT COMPANY.

W. H. Woolcock, Foreman.

The past season is the first that this claim has been worked as a hydraulic proposition, and from present indications it is likely to be a profitable investment to its owners. The secretary writes me as follows:—

"This is a hill channel running at right angles to and on the south side of Williams creek, one and three-quarter miles below Barkerville. The outlet of the channel was discovered by a tunnel driven under the main trunk road about seven years ago. After striking 'pay,' the grade of the tunnel was changed, an 18-inch flume laid in it, and a ground-sluicing claim opened in the hill, the property being worked in that way for three seasons, when the owners sold out to Mr. E. A. Bremner, of London, from whom the present owners obtained it in July, 1901.

"Fitting the property up as a hydraulic claim was begun in August, 1901, and about 600 rods of ditches and flumes were completed before winter set in. Last spring a No. 2 Hendy monitor, with 1,250 feet of 11 and 9-inch pipe, was put on. Fifteen days' water was lost through non-delivery of some of the pipe, which left 43 days of actual piping. About 70 feet of the channel was worked from rim to rim with a maximum number of seven men. The bank is about 40 feet in height, composed of bedrock gravel 12 to 14 feet deep, with gold all through it, clay for about 20 feet, and from 6 to 8 feet of loose top gravel with black sand, but no gold. Notwithstanding the disadvantages met with in opening up this claim, it paid beyond working expenses, and next season should do well. A reservoir, about 900 feet in length and 6 to 7 feet in height, was constructed this fall, and will materially increase the use of the water next year."

The Forest Rose Company, James Innes, foreman, an old and well-known mine, which has been allowed to lie idle the past three years, was again started this fall, ditches and flumes being repaired and put in order for re-commencement of work in the spring.

The First of May Company, on upper Williams creek, and the Butts Company, on Stouts gulch, are the only other companies working in the vicinity of Barkerville which have paid anything above current expenses, although there are quite a number of small companies which annually produce more or less gold.

Grouse Creek.

The Waverly Hydraulic Company, John Pomeroy, foreman, did very well for the season, working about 50 feet of the channel to a width of nearly 200 feet. Six men were employed for about five months, and 250 ounces of gold were produced. There is half a mile of ground yet to work, and should the gravel continue to improve as during the past season dividends to the shareholders are hereafter assured.

The *Short Bend* claim was purchased by Robert Brittle from Messrs. Baker and Deacon, and piping has been continued on fairly good pay.

Messrs. Bibby and Carey have this fall put on a hydraulic plant to work the benches higher up Grouse creek, and will be ready to take advantage of the spring freshet.

Messrs. Lasell and Wendle recently commenced work on the old *Hard-up* claim, situated immediately above the Waverly Company's ground, continuing an old tunnel which had been run some years ago into the hill, in the hope of discovering the lost lead of the former Heron Company. They will continue this work during the winter.

Antler Creek.

Few companies have been operating on this creek during the season. The Cariboo Deeps, Limited, of which Mr. C. E. Carry, C.E., is manager, gave employment to four to six men, extending the tunnel, which is situated immediately above the old saw-mill flat, up stream, but was unsuccessful in finding gold in paying quantities, the bedrock being found hard and worn smooth, and consequently unfavourable for arresting the gold.

On Nugget gulch, the same company sank several shafts to bedrock, but was here, also, unsuccessful in finding gold in remunerative quantities.

The Lasell Company, of China Creek.

On China creek, a tributary of Antler near Wolf creek, B. A. Lasell & Co. have developed what promises to be a very valuable hydraulic mine, regarding which Mr. Lasell writes me as follows:—

"Water was turned into the pipes May 10th, and piping carried on steadily until July 20th, when it was necessary to commence cleaning up in order that the water might be turned out of the ditches as soon as possible and to allow of the enlarging of the entire ditch system. This work was commenced about August 15th, and completed October 1st. An additional and larger sluice flume was built to accommodate the increased water supply, as well as the increased width of the channel, which is now over 200 feet wide from rim to rim, the bank averaging from 70 to 80 feet in height. The returns from this season's wash-up were in every way satisfactory, and, with the available water supply doubled, as it will be for the coming year, the owners of this property should have a very satisfactory dividend at the end of the season, as the mine is now thoroughly exploited and equipped with an up-to-date plant. The number of men employed during the season was from 9 to 10."

Cunningham Creek Property.

On Cunningham creek, Messrs. Thompson, McGregor & Ross have continued without interruption the extensive preparatory works requisite to the opening up of their hydraulic mine, upon the completion of which another comparatively permanent contributor to the product of the District will be added, regarding which Mr. Thompson says:—

"During the year 1902 from three to seven men have been employed. The season's operations were confined to ground-sluicing at the foot of the basin, and the driving of the bedrock cut. Upon ground-sluicing at the foot of the basin, we discovered that we had 125 feet more rock to cut through than we anticipated, which has delayed the finishing of the flume for some three months, but with reasonable weather we anticipate its completion by the end of January, 1903. During the year, 1,250 days' labour were performed, the total expenditure being $5,000. The only addition to the plant is a boom derrick and a car. Upon the completion of the flume, the remainder of the season will be devoted to the building of a new camp, to consist of a dining-room and kitchen, a bunk-house, store-house, and quarters for the men. During 1903 we shall get only a short run, as great care will be required until an opening is obtained at the head of the flume. Our ditch will be enlarged, and 1,200 feet of new flume constructed, and a hydraulic plant installed, and by the spring of 1904 we anticipate that Cunningham creek will once more become a substantial contributor to the mineral output of Cariboo."

Messrs. Lasell & Wendle, having purchased from Messrs. Johnston & Fry the concessions formerly held by the Menominee & Marinette Company, on Cunningham creek, and, having equipped the property with pipes and monitor, will be ready in the spring for piping.

Several other small companies of lesser note continue to work on Cunningham creek with varying success, all producing more or less gold.

Swift River.

This stream, situated in the centre of the gold belt, strangely enough has hitherto remained unexploited; last year, however, it attracted the attention of Messrs. Page, Boursin and Murray, who, having located several leases, introduced a boring machine, which they operated a good portion of the season, but, although the machine did its work satisfactorily, they have been unsuccessful, so for, in striking pay gravel, regarding which Mr. Boursin writes me as follows:—

"On the Page and Company leases, near the head of Swift river, prospecting was done during the summer of 1902 by means of a horse-power drilling rig, an innovation in placer prospecting in this district. This light, easily transported type of machine has been successfully used for the same purpose in California, Oregon and Idaho, and we find it to be especially adapted for prospecting placers situated off the waggon road, and are entirely satisfied with the work it does.

"Three 6-inch holes were put down to bedrock, viz:—31 feet 4 inches, 52 feet 7 inches, and 72 feet in depth. Gold was found in all the holes, but not sufficient to pay, so the machine was moved to the lower end of our ground, which will be thoroughly tested next season."

Slocan-Cariboo Company, Limited, of Canadian Creek.

H. T. Windt, Manager.

This Company has continued the work of opening up and placing the mine in shape for hydraulicing, but, apparently, has not as yet got on to gravel of the same character and value as that formerly worked by the old Clear Grit Company. I take the following notes from the manager's report to his Company, which was furnished to me for the purpose:—

"In the spring we were in a position to pipe off all the shallow ground and push ahead into the *Clear Grit* drifting, and this has now been done. The shallow ground yielded 38½ ounces of gold. Upon our water supply failing, we gave our attention to deepening our bedrock cut some five feet, to enable us to reach the deeper ground ahead, and placed the iron gates in position to receive the monitor purchased from Mr. Baker. Later in the season,

through the kindness of Messrs. Carry and Boursin, we were enabled to replenish our water supply by bringing through their ditch water from Grouse creek. With this additional supply we continued our piping on towards the old *Clear Grit* shaft, where some promising gravel came in sight; in fact, this gravel looked so well that several old miners of from 25 to 30 years' experience, who visited the claim, say that the prospects for next season are excellent, and should be highly satisfactory to the Company."

Messrs. Carry & Boursin, who hold a lease on the upper part of this creek, and had put up a shaft-house, placed a steam engine and brought in ditches, have done nothing during the past season to prove their ground, presumably in consequence of a lack of capital to open up the mine in proper shape.

The above are the only two companies at present holding ground on Canadian creek.

Cariboo Consolidated, Limited.

M. Bailey, Manager.

It is gratifying to find from the manager's report appended hereto, that the output from this Company's mine at Lowhee creek has been satisfactory. The Company is still operating over ground that had been previously drifted, and will probably take several years yet to reach its unworked ground. The manager says:—

"A further progress of about 150 feet was made in opening up the channel of Lowhee creek from rim to rim, making a total of about 800 feet of the channel opened during the past three seasons. A total of 20,200 cubic yards of material was moved, yielding satisfactory returns. The Stoney creek ditch was continued a distance of three miles, to intersect Jack of Clubs creek, and surveys were made to continue this system of ditches to Ella lake, with the object of using this lake as a storage reservoir, and bring water into the same by a proposed ditch from Lightning creek. The Lowhee claim is now equipped with 8½ miles of ditches, which supply water to two pipe lines, composed of 15 and 11-inch pipe, operating under heads of about 160 and 230 feet, respectively. The sluice flume is a double compartment one, having a total length of 1,140 feet. The length of ground in the channel which has yet to be worked on this claim is about 6,350 feet. The daily average number of men employed from 1st April to 14th October has been 15.

The Thistle Gold Company, Limited.

James Ross, Manager.

This Company has operated most successfully, under the same management, two hydraulic claims, one at Coffee creek, the other on the banks of Eight-mile lake. I am not definitely informed as to the amount of gold produced, but have every reason to believe that the Company has received good dividends therefrom. Mr. Ross furnishes me with the following concise account of the operations:—

"During the past season the Company operated two properties, one on Coffee creek and one on Eight-mile lake. The Coffee creek property, consisting of two leases, was acquired by the Company after the close of the season of 1901. During the winter months a hydraulic plant was installed and a pipe line, 1,200 feet in length, laid, giving a pressure of 180 feet for one No. 2 monitor. A 26-inch flume, 120 feet long, was built. Piping was commenced on the 8th of May, and discontinued on the 19th of June in order to give the water to the property at Eight-mile lake. During the remainder of the season the bedrock was cleaned and the flume built ahead to the working face, making the present flume about 384 feet long. This work was completed about the middle of July. The average number of men employed was 7. At Eight-mile lake, piping was commenced on the 3rd of May, and continued until the 31st of

October. Work was carried on day and night until July 12th, when it became necessary to lay off the night shift, on account of lack of water. For the balance of the season piping was carried on during the day only. In this time 15 days were lost on account of dry weather. Heretofore the ground has been piped through temporary flumes, but as the work was carried back from the lake it became necessary to put in a permanent flume; this was done in the latter part of the season. The flume, paved with blocks, is 2 feet wide and 528 feet long. The average number of men employed was 8."

On Summit creek, which, for some years past, has attracted considerable attention, a few men only continued to work, with varying success, during the past season.

Stewart creek also has not, so far, fulfilled the hopes entertained of it a year ago. Mr. Peter Sutherland, who has an option on Messrs. Isaac & Co.'s property, has at the present time a few men sinking a series of shafts to test the value of the gravels, with a view to shewing whether the ground can be profitably worked as a hydraulic proposition.

Mosquito Creek and Willow River.

On Mosquito Creek the Flynn Brothers & Co. have done exceedingly well this season. For many years past their claims have paid handsomely, and having now installed a hydraulic plant on the Williams lease, which was heretofore worked as a drifting proposition, even better results for the future are anticipated. Mr. H. E. Flynn reports as follows:—

"We have worked two claims, namely, the *Alabama* hydraulic claim, which piped nearly four weeks, 10 men being employed, and the work being done wholly on drifted ground, with very satisfactory results; and the *Williams* claim, fitted up a year ago with new ditches, flumes and pipe, and hydrauliced this season for the first time, with very encouraging results, piping being carried on for about five weeks, and 5 men being employed. The outlook for these claims is very bright, as we now have them opened up in shape to work to advantage, and there is ground enough to ensure the profitable operation of them for the next 30 years to come."

The Willow River Company.

F. C. Laird, Manager.

This Company is still endeavouring to reach the bottom of the channel, and the difficulty in contending with the water encountered would appear to be the only obstacle (judging from prospects obtained) preventing the realisation of valuable returns. There have been no further actual developments of the mine since last report, and the situation may be briefly stated as follows:—

After breaking through the bedrock into the gravel in the channel and obtaining a most excellent prospect of coarse gold, the Company was forced to suspend work on account of the great quantity of water encountered, when Mr. Laird at once proceeded East and procured two additional pumps, which it is proposed to operate by water power, and by utilising the present pumps to keep the bedrock tunnel, through which the channel was first tapped, free from water, it is thought there will be no difficulty in sinking through the gravel. Ditches, flumes, tail-race and wheel-pit have already been constructed, a shaft sunk to the level of the drain, and a water-wheel just completed. A large log shaft-house, 40 feet by 80 feet, has been erected, and every conceivable bar to success has, it is thought, been removed, and, should no unforeseen accident occur, the Company ought to be producing gold by the early spring.

Pleasant Valley and Jack of Clubs Creeks.

Two enterprises of moment have recently been started under the management of Mr. L. A. Bonner, the success of either of which would be of material importance to the District. Regarding them Mr. Bonner says briefly:—

"The object of the enterprise is to prospect for a back channel on Jack of Clubs creek. Boring operations located the position of a channel, showing presence of gold, and a tunnel of 600 feet is being run to bedrock, 386 feet having been already driven. A camp has been built, dump-box and sluices placed in position, and water laid on to wash gravel. The tunnel will probably be completed by 1st February.

"Nine half-mile leases have been acquired on Little and Pleasant Valley creeks, and the consolidation of the same will be effected forthwith. Work has been started to bottom the deep ground, at a point opposite the Campbell hydraulic claim. A shaft-house has been built, hoisting plant installed and pump placed in position. A tunnel of 360 feet is in course of construction, to tap the shaft at a depth of 40 feet, thus draining off the surface water down to the clay. A steam sinking pump extra to the working beam pump is being put in. The work of sinking will be re-started as soon as the tunnel is connected with the shaft, probably by the first of January. The shaft is now at a depth of 37 feet. Bunk and cook-houses, office, stable, etc., have been built. Should developments prove satisfactory, a large plant will be installed next spring."

Slough Creek, Limited.

William Thompson, M.E., Managing Director; John Hopp, Local Manager.

Probably the most important and costly enterprise in this part of the District, at this time, is that of proving the value of the deep channel of Slough creek, an undertaking which the Slough Creek, Limited, has been engaged in for several years past. It, therefore, affords me much pleasure to be able to report at last not only the complete success of the efforts to reach the bottom of the channel, but that the Company has found the gravel rich, quite equal to expectations. The manager, in reply to my application for information, hands me a copy of Mr. Thompson's report to his Company, from which I make the following extracts:—

"I left England on the 18th June, and proceeded direct to the mine. I found the whole of the work connected with the installation of the pumps, the driving of the main tunnel and the erection of the water locks in the tunnel had been most carefully carried out according to my instructions. The two Worthington pumps, which had each a capacity of 500 gallons per minute, had been erected with great care in the specially prepared pump chamber, which is 28 feet in length by 23½ feet in width. This chamber is divided into two separate compartments by a double row of 14-inch squared posts down the centre, which were considered necessary on account of the broken character of the slate forming the bedrock. The pumps work well and smoothly, and the advantage of having the floor of the pump chamber about 4 feet above the level of the floor of the tunnel has been daily apparent, as, owing to the small amount of water hereto met with, it has been found advisable to allow the water to accumulate for some time in the tunnel (till it has a depth of 12 or 15 inches at the shaft), and then to pump it out by means of one of the large Worthington pumps.

"The main tunnel is 1,071 feet long, and is 8 feet wide and 7 feet high. At a point 889 feet from the shaft the tunnel is contracted, and here are placed the water locks. These are made of steel plate, set in buttresses of concrete recessed into a groove cut in the walls, roof and floor of the tunnel. There are two water-tight frames 15 feet apart, each provided with steel doors, which can be immediately closed in case of necessity. Openings are provided by means of pipes for compressed air, ventilation and drainage, the pipes being riveted to the steel frames and passed through the buttresses. Arrangement is made by means of a series of pipes provided with pressure gauges for admitting compressed air either within the space confined by the doors, or in the tunnel beyond the farther door, and of equalising these pressures when required. Insulated wires for telephone, lighting and power purposes have

also been arranged for and provided during the erection of the steel and concrete locks. At a point in the tunnel 142 feet beyond the last water door an upraise has been driven for a distance of 97 feet, rising 22 feet from the floor of the tunnel in that distance. The position of the bed of the creek channel was ascertained by our borings from the surface. The main channel not having been tapped by this upraise, as was confidently expected by the manager, it would appear that the bed of the main creek has swung round towards Nelson creek, and a drive was therefore put in towards the south in the direction of Nelson creek, and bore-holes were put up on each side of the drive. These bore-holes showed that the gravel was lowering on the east side of the south drive, and a drive was therefore put in towards the east. The bore-holes showed that the gravel continued to lower. At a point about 22 feet in the gravel made a sharp drop, and it was here that the first heavy pressures were met with.

"To lessen the risk of losing the drive through any sudden inflow of water and gravel, the place was driven very small, with only a 2-foot cap, and the faceboards were kept well up; at the time the pressure was met with only the tap-board was out, as the lagging was being driven forward. There was a sudden outburst of water which not only pressed a quantity of gravel but forced its way behind the lagging for several setts and ran into the drive at all points. The faceboards were rapidly replaced, the space being tightly packed with brush, and a bulkhead of stout timbers, which had been held in readiness in case of possible accident, was at once erected. The straining of the timbers was so great near the face that it was thought advisable to erect another bulkhead further back in the drive, and the place was left to drain. How great the pressure was at the time was shown when, some weeks later, this drive was re-opened and re-timbered where necessary. The lagging in the face and on the left-hand side of the drive were crushed in, and the caps, short as they were, were twisted practically to matchwood. The posts of the first two setts were pressed backwards at the roof till they were several inches out of the perpendicular, and the stays between the posts and the caps, which had been intentionally put in of unusual strength, were pressed at each end more than an inch into the solid timber of the sett.

"The drive to the south was then continued and bore-holes put up every 3 feet 6 inches, and at about 91 feet from the upraise the gravel was almost upon the lagging. Unfortunately, the bedrock was so soft and weathered at this point as to have the consistency of clay, and the gravel above was so mixed with sand that the water making in the face was always muddy and evidently bringing along with it considerable quantities of material. I did not consider it advisable, therefore, to continue this drive further, as it would be likely to give us very serious trouble were we to meet with a bed of slum at the point of breaking in, where any sudden eruption of water could not be controlled, as in the case of hard gravel.

"I therefore advised that another attempt be made with the east drive, and this drive was re-opened and re-timbered; its condition, on going into it again, has been already described. The water which was making in this drive could not, however, be kept out of the face, and this made it practically impossible to continue work here. Boreholes were put up which had the effect of drawing the water for a time, but immediately work was begun again on the gravel, the water left the bore-holes and returned to the face. A second drive to the east was therefore commenced, about 22 feet to the south of the first, it being considered that the water flowing would probably keep to either one or the other of these drives, or possibly go from one to the other; in which case the drive, which was clear, would be pushed ahead.

"With regard to the character of the gravel, that which has been procured through the bore-holes is a perfectly smooth, rounded wash, containing a considerable quantity of pyrites. The gravel obtained from the east drive (about half a yard) was taken out and washed in the sluices, and from it half an ounce of gold was procured; but it must have contained a good

deal more, as it was quite impossible to clean up the floor of the drive owing to the flow of water over it, and to the number of spreaders. The gravel in drillings from the bore-holes put up has all been panned off, and in only about two cases have no colours of gold been found in the pan. In every other case colours of gold were found, in many cases quite numerous, and some of them fairly heavy. The fact shows, beyond any doubt whatever, the auriferous character of the wash; and personally I feel sure that as soon as we have been able to carry our drives into the channel we shall find gold in sufficient quantities to amply reward us for our expenditure and labour."

The Cariboo Exploration Company.

On Burns Creek, the Cariboo Exploration Company, Limited, has had a successful season, although considerable time was lost in piping non-productive ground in order to properly locate the run of the pay gravel. However, on the whole, the results appear to have been satisfactory, and the claim promises well for the future. Mr. Hopp, the manager, gives me the following information: —

"This mine is equipped with four miles of ditch and flume from Jack of Clubs creek. The ditch is 4 feet wide at the bottom and 7 feet at the top, and is capable of carrying 1,600 miner's inches of water. The pipe line is 2,400 feet long, and consists of 30, 22 and 15-inch iron pipe, with an 11-inch branch from the 22-inch section, and supplies two monitors, one No. 2, and one No 6, under a head of 280 feet. Thirty-six thousand yards of material were removed during the past season, and the result was satisfactory. Owing to the large quantity of boulders that required blasting, the progress was somewhat retarded. After the close of the hydraulic season the plant was put in order for next year, 200 feet of new flume laid up to the face of the pit, and everything made ready to turn on the water. Considerable shaft sinking was done to determine the depth of the gravel and the width of the pay, with good results. The season's water supply was considerably below the average, owing to the very light snowfall during the winter, and light rains during the latter part of the season."

Dragon Creek Mining Company.

Gust. Lange, Manager.

Regarding this mine, I regret not having been able to obtain a report from Mr. Lange before his departure for the lower country, but am credibly informed that it has paid well, over $1,000 in nuggets having been picked up during the process of piping, and before cleaning of the bedrock commenced. About 15 men were engaged during the season, and it is generally believed it has been one of the most prolific producers of the precious metal in this part of the District.

Lightning Creek and its Tributaries.

On *Van Winkle* claim, situated on the right side of Lightning creek, immediately above the old town of Van Winkle, a very rich bench was struck late in the fall or winter of 1901-2, from which, in a few weeks, many thousand dollars were taken. The gold was coarse, mostly in large nuggets, and was found principally on the bedrock. It was not an uncommon thing to obtain several ounces to the pan and, although this bench is from 15 to 20 feet above the deeper channel of Lightning creek, the Company has been much troubled by the breaking in of water from the old worked diggings, or from the creek, and for this cause was able to do little work during the summer months. Upon cold weather setting in this fall, the water subsided in the diggings and the Company resumed work. Although not paying as largely as at first, the claim continues to return dividends. Mr. Tregillus, the secretary, writes me as follows:—

"This is a drifting claim with 5 owners. The shaft was sunk in August, 1901, in gravel 41 feet, striking a top streak of pay gravel about 15 feet higher than the deep worked channel and overlying a stratum of slum. Connections were made with the old workings to furnish drainage. This gravel streak, which contained many large washed boulders, paid irregularly for about 20 feet, when bedrock was struck on what afterwards proved to be a bench. After this, for a number of sets (8-foot cap) it paid from 6 to 9 ounces, and gradually improved until one set yielded 50¼ ounces, and another 78½ ounces, but these were exceptional and a good deal above the average. In some cases where the ground is not very firm and face-boards are used, half a set is considered a good day's work, but where the gravel is more solid and dry, a set a shift is taken out by 6 men. The gold is very coarse, most of it ranging in pieces from ½ to 6 ounces. Opinions differ as to the source of this lead, whether it came through the *South Wales* or through the canyon, sufficient work not yet having been done to decide the point."

The *Point* claim, which adjoins the *Van Winkle*, extending more into the hill and down stream, was purchased last July by Messrs. Andrew Kelly and W. C. Fry, from D. R. Shaw, who is at present in Dawson, and as soon as the water subsided in the fall a shaft was sunk and the owners immediately began taking out gold in large quantities, tracing the run of gold farther into the hill and even eclipsing the product of the *Van Winkle*. From one pan of dirt 56¼ ounces, or nearly $1,000, were obtained. The claim continues to be worked when not flooded with water, to which it is liable, the works being connected with those of the *Van Winkle*. I am credibly informed that this mine has produced upwards of $20,000 since commencing operations last fall. Sufficient work has not as yet been done to decide definitely whether these discoveries will prove the existence of a new channel in the hill running parallel with the Lightning creek channel, or merely show a divergence of the old creek channel; probably the latter, as the creek channel in front was not as rich in gold as above and below.

CARIBOO CONSOLIDATED, LIMITED.

M. Bailey, Manager.

The *Ah Quay* claim, now the property of the above Company, was worked during the season. Mr. Bailey writes as follows:—

"A total of 10,500 cubic yards of material was moved during the past season, the work being principally of a prospecting nature, to determine the depth and extent of the gravel. The water to work this is very limited and is brought from Last Chance creek through a ditch ¾ of a mile in length, supplying water to a pipe-line of 15 and 11-inch diameter pipes, operating under a head of about 130 feet. The length of the sluice flume is 424 feet. The total area of this claim is 160 acres, very little of which has been worked. The daily average number of men employed from 1st April to 8th July has been six. Extensive surveys were made, during the past season, of the Lightning creek claims owned by this Company, with a view of opening up the deep channel of this creek. Plans and estimates have been made for sinking a triple compartment bedrock shaft, from which a double track tunnel will be run to tap the deep ground. This work will be located about 1½ miles below Stanley. As soon as possible next spring a complete system of borings will be made, to accurately determine the position and depth of the channel. The chairman of this Company, Sir J. Bevan Edwards, of London, made a careful inspection of the various properties owned by the Company last summer, with a view of deciding the future development of these claims."

Aside from the foregoing, there have been a number of claims operated in a small way on upper Lightning creek and its tributaries, some working in the hill, in the hope of developing new channels, while others are taking out small pay by working over old ground in the creek.

The Gold Gravels and Drainage Company.

This Company, operating on Lower Lightning creek, experienced a mishap when breaking into the channel with its bedrock drive from the shaft, owing to a sudden inrush of water and gravel, which filled the tunnel and rose up some distance into the shaft. Upon procuring more powerful pumping appliances work was resumed, but upon breaking into the channel a second time the men were again driven out. I take the following extracts from the manager's report to his Company, dated 28th October last:—

"The water wheel, which had been broken last year at the close of the season, was promptly repaired and the shaft and tunnel cleaned out, preparatory to continuing work. The shaft is about 140 feet deep and the tunnel therefrom, extending out under Lightning creek for the purpose of striking the old channel, is about 200 feet long. The end of this tunnel was somewhat on an incline, and after it was broken through last fall by former Superintendent Jones, it showed the rimrock instead of the bedrock, which required our going back in the tunnel and running it on a level, in order to get at a lower depth to strike the very bottom of the stream, or what is called bedrock. This was done for a distance of about 98 feet, and I then ran a drive or tunnel, known as No. 1, for a distance of 56 feet, and worked through the edge of the rock. The water was very strong—in fact, so strong that while it could be pumped, still it interfered very much with the men's working—and I then ran off another drive or tunnel for a distance of 44 feet, and worked through at another point, for the purpose of dividing up the flow of water, so that the work of the miners would be less hampered. All of this work continued steadily until about the 22nd of September, or a total of about five months. We were then breaking through with the last drive—in fact, had broken through some little time and were going through the gravel—when we had a sudden rush of water with considerable slum in it, which was more than the pump could handle.

"Upon communicating with the head office, I was requested to close down for the time being and await instructions. These instructions were to the effect that I should return and plans would be arranged to resume operations as shortly as possible, with the full equipment necessary to handle the water or meet any other difficulties."

Peters Creek.

The Premier and White Star Companies, which were promoted by and worked under the management of Mr. J. G. Mathers, M. E., have done comparatively little during the season. Mr. Mathers informs me that on the *Premier* ground nothing has been done (owing to a want of funds), other than to keep the tunnel and works in a proper state of repair.

On the *White Star* claim, where an engine-house had been erected, engine and boiler were placed, blacksmith shop put up and all made ready to continue sinking the shaft. This Company, however, not having furnished sufficient capital, the claim has remained *in statu quo* most of the season.

Quesnel River.

I am again indebted to Mr. W. A. Johnston for information relating to the mining operations in the Quesnel Polling Division of the District. He informs me that there have been about 40 men, including Chinese, engaged in mining on the Quesnel river and its tributaries during the season, about 15 on the Fraser river, 7 on Hixon creek, and about 8 or 10 on the Cottonwood river, making about 75 all told, of whom 40 were white men. The wages for whites is $3.50 per day, and for Chinese from $2 to $2.50 per day. The total amount of gold produced is approximately $46,000.

The National Hydraulic Mining Company, of Quesnel River.

This is the only enterprise of any considerable magnitude in this vicinity. Having completed the ditches, flumes, etc., piping was begun about the middle of June, but soon uncovered a ridge of rock which was found running parallel with the river, preventing the reaching of the deeper ground farther back, which was known to exist from the fact that shafts had been previously sunk. The Company was thus compelled to confine piping operations to the front of the rim-rock. Failing to find an outlet through this rim-rock, the Company is now engaged in running a tunnel through it with sufficient grade to be utilised for a sluice. This work is expected to be completed by May next. The prospects obtained from the shafts sunk behind the rim referred to warrant the impression that the mine will be valuable as a hydraulic proposition. The Company has expended about $65,000 in development work to date.

Three current wheels are in operation on the Quesnel river, and are used to raise water on to the benches for sluicing purposes. The benches are profitably worked by this means.

Several other small companies of whites and Chinese are engaged in mining the benches along this stream.

Messrs. Meyer and Bjornson have applied for and obtained licences to prospect for coal and oil over tracts of 640 acres each, near the town of Quesnel, and, I understand, contemplate commencing boring operations in the spring.

Dredging.

No further attempts at dredging have been made in the District this season, which I regret, as the conditions found here appear favourable. In the first place, being near their source, the streams are small, rendering it possible to anchor a dredge with facility; secondly, the boulders in the bed of the streams are less compactly wedged together than elsewhere and, consequently, more easily removed by the dredge; and thirdly, and what is, perhaps, of more importance, the gold is found in coarser particles, and is, therefore, more easily saved. It would, therefore, be hasty to assume that because dredging on the Lower Fraser and other large streams has, thus far, proved unsuccessful, the same would follow under the more favourable conditions here mentioned.

Mineral Claims.

Comparatively speaking, little has been done to further develop the numerous quartz veins of the District, if I except the work at present being done by Messrs. Baker and Atkin, of whose efforts in this direction Mr. Atkin speaks as follows:—

"Mr. C. J. S. Baker and myself have devoted all the working season to prospecting quartz in the neighbourhood of Barkerville. We have bonded the *Pinkerton* claim and the B. C. Milling and Mining Company's location, both on Lowhee creek, and two of E. Perkins's claims on Burns mountain. A considerable amount of work was done in prospecting these properties by sinking shafts, driving tunnels, and pumping out old workings. A large amount of assaying has been done, and is still going on, both on samples from these properties and a number of others. The Government Reduction Works, with its one-stamp mill and cyanide plant, was leased, and samples of ore, from 1,500 pounds to 15 tons, were crushed and treated. As neither the series of assays nor treatment of ore is complete at the time of writing, it is impossible to give the results definitely. Though a number of the reefs examined have turned out to be too low grade to be worked at a profit under present conditions, it is believed, nevertheless, that several will be well worth working with modern methods, and it is intended to renew investigations as early as possible next year."

OMINECA DISTRICT.

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OMINECA MINING DIVISION.

REPORT BY FRED W. VALLEAU, GOLD COMMISSIONER.

I have the honour to submit my fifth annual report upon the mining industry of the Omineca District for the year 1902. The past season has, I am sorry to say, been an unfavourable one on account of high water. The month of June was one succession of rain storms, there being 28 days during which rain fell, while July had 19 and August 16 days rain. The consequence was that very high water prevailed during the whole season, retarding work very much and, in some cases, altogether preventing it from being carried on.

Now that two transcontinental railroads are heading for the Pacific coast, both of which will tap the Omineca District, and one of which, if the Pine or Peace River Pass is chosen, will pass within a short distance of Manson creek, which is at present the centre of mining operations in this vicinity, the Omineca District is bound to spring into prominence, as once the great cost and difficulty of travel and transportation of supplies have been reduced, as they will be by railway communication, the hundreds of square miles of country that at present are unknown and unprospected will be thrown open. A vast extent of country lying north of the Omineca river and west of the Findlay is known at the present time to contain gold in paying quantities if supplies could be got into that portion of the District, and it only requires improved means of transportation to convert this locality from an undeveloped wilderness, as the greater portion of it is to-day, into one of the richest and best mining districts in the Province. A railway will place Manson, as regards transportation, in the same position as Revelstoke on the C. P. R. is at present. During this past season several parties of prospectors were in the District, but on account of shortage of supplies were unable to push their way any distance from Manson. Some, however, were so favourably impressed with what they saw of the country they have stored part of their outfit and intend returning next season.

A number of men are wintering in the District, some developing their properties and others hunting and prospecting. Following is described in detail what has been done by the different Companies in the District:—

THE 43RD MINING AND MILLING COMPANY, OF CARIBOO, LIMITED LIABILITY.

This Company, which has been operating on Kildare and Slate creeks for the past seven years, has not carried on work this past season, having been in financial difficulties. I am pleased, however, to be able to say that from information received from the Company, I learn that it will be in a position this coming spring to resume operations on a large scale, it having acquired all the necessary capital to place its property on a paying basis. The fact of this Company not operating this year reduced considerably the number of men in the District, and, for the time being, prevented others from coming in.

THE ARCTIC SLOPE MINING COMPANY.

This Company carried on operations on one of its claims this season, employing 12 men up to the end of July, when provisions gave out and the manager was forced to close down the work. The ground worked paid well, only about 20 days actual mining being done and

$3,760 recovered at the clean-up. This Company has some very good ground in the District, but has been very unfortunate in its management. I believe at the present time the Company is being re-organised.

The St. Anthony Exploration Company, of Santa Barbara, Cal.

This Company was granted a lay-over upon its property for this past season, so that no work has been carried on by it this year.

I am sorry to say that the St. Anthony Company contemplates abandoning its leaseholds and selling its large plant and supplies to a Syndicate that will operate in the District next season. Mr. Garrett T. Richards, President of this Company, writing says:—"In retiring from the Omineca field, it is not with the belief that there is nothing of value there. The trouble with us has been that it has taken all our small syndicate could devote to this venture to prospect the bench claims of the Germansen river, where we operated, and we do not know now but what the river claims are very valuable."

A lay-over was also applied for and granted upon the Bread Winners Group during the past season, and nothing was done by the owner, E. G. Tilton.

The Newitt Claim, Lost Creek.

Messrs. Newitt and Mullin, owners of this property, are now driving to tap the back channel of Lost creek, which they hope to reach in about 280 or 300 feet; they are now in 127 feet. They have been delayed by some very difficult ground, but have now passed the worst of it. These gentlemen have built a most comfortable house and blacksmith shop, have ample provisions and supplies of all sorts to last them for next season, and are confident that they have a good claim. This claim is supposed to contain the lost channel of Lost creek, which paid very well down to this point in the early days.

The McKinnon Mine, Lost Creek.

The principal work done on this property during the past season by Mr. McKinnon was the turning of the creek on to the hill by means of a ditch and allowing the stream to cut down the gravel by ground-sluicing. This property will probably change ownership this spring, as a syndicate is being formed in Victoria to acquire it.

The Eureka Mine, Black Jack Gulch.

This is a new property situate on Black Jack gulch, above the claim owned by the Arctic Slope Hydraulic Mining Company. It is owned by Mr. James Munroe and others, and consists of a back channel of Black Jack gulch. Mr. Munroe and a partner are remaining in the District this winter and are running a tunnel to tap the channel. When I saw the property last fall the prospects looked most promising. A house, blacksmith shop, etc., have been built; supplies and provisions to last a year have been laid in. I expect to hear good accounts of this claim next spring.

On the *Evans* claim, Manson creek, the high water experienced this past season made it impossible for Mr. Evans to work the lower portion of his claim, so he has this year been putting in a wing-dam which will enable him to work the upper portion next season.

Vital Creek.

Owing to an option for one year having been given on its property by the Vital Mining Company to a London Syndicate, nothing was done except a little prospecting by the latter to ascertain the values in the gravels.

The Caledonia Mining Company was granted a lay-over again this season as it is impossible for it to work this property until the Vital Creek Mining Syndicate opens up its leasehold to the dividing line.

Tom Creek.

Actual mining was carried on by the May Flower Mining Company all the season, and the ground proved to be exceptionally rich, but very deep. The expectations of the owners last year, that the bedrock would rise, have not been realised. As the clean-up had not been made when I passed through Tom creek on my way outward, I am unable to state what the results of the season's work have been.

Quite an amount of prospecting has been done on this and other creeks in the District by a number of Chinamen, but other than collecting their free miner's certificate dues and revenue tax I find it impossible to find out from them what they are making.

The report from the Sub-Mining Recorder at Fort St. John is not yet received, so I have no information regarding the Peace river. A number of prospecting parties are being organised to go into that portion of the District next spring.

Office Statistics:

Free miners' certificates	$ 201 25
Rentals on leases	1,360 00
Mining receipts general	960 25
Revenue tax	111 00
Tax on mines and minerals	67 53
Trade licences	30 00
Assessment tax	97 65
	$2,827 68

SOUTH-EAST KOOTENAY DISTRICT.

FORT STEELE MINING DIVISION.

REPORT OF J. F. ARMSTRONG, GOLD COMMISSIONER.

I have the honour to report as follows on the progress of mining in this Division during the year ending December 31st, 1902.

The following table shows that there has been a decline in prospecting since 1899, and that fewer assessments are now being performed than formerly, resulting no doubt in the "weeding out" of the poorer class of prospects.

Sections.	Held under Crown grant or Certificate of Improvements.	Certificates of Work.	New Locations.	Total number existing Claims.
North-east	.....	20	2	22
East Centre	32	146	45	223
South-east	4	25	45	74
South-west	28	60	46	134
West Centre	83	189	110	382
North-west	.....	11	5	16
Total for 1902	147	451	253	851
" 1901	135	642	455	1,232
" 1900	105	704	470	1,279
" 1899	68	718	729	1,515

NORTH-EAST SECTION.

This section, which comprises the drainage area of Wasa, Sheep and Wolf creeks, has been very little prospected, twenty certificates of work and two new locations having been recorded.

The annual assessment work on the claims here is all that is reported in the way of development. On the *Poor Man Group*, formerly known as the *John Bull Group*, the assessment work during 1902 consisted of 60 feet of tunnel driven with satisfactory results.

EAST CENTRAL SECTION.

This section comprises the drainage area of all creeks emptying into the Kootenay river from the east, between and inclusive of Lewis creek and Bull river.

The most important groups of claims in this section are the *Estella*, on Tracy creek, which has some 3,000 feet of development work done; the *Tit for Tat*, *Coronado*, *Dardanelles*, *Big Chief* and *Golden Five Groups* on Wild Horse creek; the *Dibble* and *Silver Queen Groups* on Lost creek, and the *Chicamonstone* and *Star Groups* on tributaries of Bull river, in the vicinity of which the Bull River Iron Mines are also situated.*

* A description of the Bull river iron deposits will be found on p. 1007 of the Minister of Mines' Report for 1901.

Outside of the annual work of representation, the development upon these groups during the past year consists of some 800 feet of work on the *Estella Group*, 500 feet of which is an extension of the long tunnel, now in some 1,250 feet and showing in one cross-cut 3 feet of clean galena, with some 15 feet of concentrating ore; 100 feet of tunnel driven on the *Silver Queen Group*, and over 200 feet of development work on the *Star Group*. No less than 146 certificates of work have been recorded for this section during the past year.

Considerable placer mining has been in progress on Wild Horse creek, but it is carried on mainly by Chinese companies and individuals.

The *Nip and Tuck* Crown-granted placer claim has been leased to a Chinese company, as also has the lower end of the *Invicta* lease. In addition to these there are three independent Chinese companies at work, and at the time of writing William Thomson and others have secured a sub-lease and are working the upper end of the *Invicta*. The Chinamen report fair success during the past year.

Seventeen new locations and 67 certificates of work have been recorded for the neighbourhood of Bull river.

South-east Section.

This section includes the drainage area of all rivers and streams south of Bull river flowing into the Kootenay river from the east.

Twenty-five new locations have been made and 18 certificates of work recorded upon claims in the vicinity of Sand and Rock creeks. Little work has been done beyond the annual assessments.

Michael Phillipps, Deputy Mining Recorder at Tobacco Plains, reports of this section as follows:—

"There has been much less work done on Phillipps creek during the past year than in previous years, because no capital has yet come into this part of the country and the cost of transport prevents the working miner from shipping at the present price of copper. Work has been done on the following claims during the year: *Belle Vue*—shaft sunk to a depth of 60 feet. *Irene*—50-foot shaft in ore. From the *Copper Giant* a considerable amount of rich ore has been taken out and piled ready for shipment. The ore on Phillipps creek is a copper pyrites, with some bornite and malachite, and the lead may be traced for a very considerable distance."

South-west Section.

This section includes the drainage area of the Moyie and Yahk rivers and Gold creek. The most important part of this section is in the immediate vicinity of Moyie lake where we find the *St. Eugene*, the *Society Girl*, the *Cando*, the *Dixy* and the *Aurora* groups of mineral claims, all silver-lead properties. Because of the depression in the lead markets very little work has been done on any of these groups during the past year. A full description of the properties of the St. Eugene Consolidated Mining Company, Limited, will be found on pages 791-2 and 793 of the Minister of Mines Report for 1900. Fifty feet of development work is reported as having been done on the *Aurora Group*, situated on the west side of Lower Moyie lake.

West Central Section.

This section comprises the drainage area of the St. Mary's river and its tributaries, and is one of the most important in the Fort Steele Mining Division, as it contains the *North Star* and *Sullivan* groups of silver-lead mines, and also many high-grade copper properties which at present are too far from transportation to be very valuable. One hundred and eighty-nine certificates of work and 110 new locations have been recorded for this section.

Sullivan Group.

During the past year the Sullivan Group Mining Company has done little to develop its property: it has, however, commenced the erection of a smelter at Marysville. Mr. G. H. Turner, President of the Company, has issued a circular letter urging the shareholders to take certain steps to save the property from the burden of debt now hanging over it, and secure enough capital to finish the smelter at Marysville and build a lead refinery as well.

The *North Star* mine has been in steady operation during the year and has shipped a considerable amount of ore. I have not yet received a report of the development work done on this property.

A number of claims have been worked fitfully in the St. Mary's river country, but I have no information concerning any considerable development.

The *Great Dane Group* of silver-lead properties, on Morris creek, closed down early in the season, when the *St. Eugene* mine ceased working.

The development on the *Faller Group*, on White Fish creek, has continued on the lines described in my report of last year.—(Minister of Mines Report, page 1006.)

North-west Section.

This section comprises the drainage area of Cherry and Skookumchuck creeks. Five new locations and 11 certificates of work have been recorded in this vicinity during the past year, but I have no information of any development other than the annual work of representation.

Office Statistics—Fort Steele Mining Division.

Mineral claims recorded	253
Placer claims recorded or re-recorded	2
Partnership placer claims recorded or re-recorded	2
Certificates of work recorded	451
Certificates of improvements recorded	12
Conveyances and other documents of title recorded	108
Documents filed	39
Affidavits filed	556
Mining leases issued	13
Mining leases in force	25
Free Miners' certificates, ordinary	563
" " companies	8
" " special	7

Revenue Collected.

Free Miners' certificates	$3,337 25
Mining receipts, general	5,857 35
Mineral tax	686 14
	$9,880 74

The revenue from the tax on coal and coke and the royalty on coal, being collected by the Department of Finance, does not appear in these accounts.

NORTH-EAST KOOTENAY DISTRICT.

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Report by J. E. Griffith, Gold Commissioner.

GOLDEN MINING DIVISION.

This past season has been quiet in the Golden Mining Division and but little more than assessment work has been done on the various properties, with two or three exceptions.

On the *Good Luck Group*, situated on McLean creek, a force of 8 men are employed and will continue working all the winter. About 800 sacks of copper ore have been packed to the ore sheds on the Columbia river and more will follow in the spring. This group is worked by the Laborers' Co-Operative Mining Company, which is also erecting a smelter at Golden with a capacity of 30 tons per day.

Big Bend Mica Claims.

A force of about 20 men was employed a portion of the summer in opening up the various claims, but in order to get in supplies about 20 miles of new trail had to be built from the end of Timbasket lake, on the east side of the Columbia river; consequently there was not as much work done on the claims as was anticipated, but the showing is said to be very encouraging.

On the *Bennison Group* work has again been resumed and a force of six men was employed until late in the fall. It is the intention of the owners to recommence operations as soon as supplies can be got in.

Ice River District.

On the *Waterloo Group* the Chicago and British Columbia Company has a small force of men doing development work. This force will be increased as soon as more supplies can be taken in. About 12 miles of waggon road were constructed this summer and a bridge will be built across the Kicking Horse river this winter.

Office Statistics—Golden Mining Division.

Free Miners' Certificates	153
Company "	7
Special "	1
Mineral Claims Recorded	144
Certificates of Work	87
Payments in Lieu of Work	3
Conveyances	32
Water Grants	5
Placer Leases in force	4
Crown Grants issued	7
Affidavits filed	242

WINDERMERE MINING DIVISION.

There has been increased activity in this Division during the past year, but many properties are still lying idle, owing to the low price of lead and silver, which has naturally retarded the advent of fresh capital. However, the progress made in the development of the working mines, the construction of new buildings for their more convenient and continuous operation, the installation of a compressor plant and the building of roads and trails to facilitate transportation to the Columbia river, are undoubtedly encouraging, and next season several additional shipping properties will be added to the list.

The various mineral belts that extend from Findlay creek to Salmon river, on the eastern slope of the Selkirks, have been partly prospected with good results. This territory comprises an area about 45 miles in length and 25 in width, and while but a small portion of it has been carefully prospected, the ledges that have been discovered shew such strength and continuity that it is reasonable to suppose that, with careful and diligent search, many more promising discoveries will be made.

Attention during the past few seasons was more especially confined to Toby creek, Horse Thief, No. 2 and 3 Creeks and their tributaries. The ledges in these vicinities have every appearance of permanence and strength; dykes can be traced for miles, and in places glacial action has stripped the veins, leaving large ore bodies uncovered. The capping of the majority of these ledges is heavy iron sulphide, interspersed with masses of solid ore. The general character of these ores is lead sulphide, carrying considerable quantities of gray chalcopyrite, and occasionally ruby silver, and some rich samples have been obtained. The general average is uniform and the ore should be profitably shipped even with the present facilities. A collection is on exhibition at the Wilmer office.

Paradise Group. This group consists of 9 claims and has shipped 950 tons of silver-lead ore, taken out in the course of development work only. The development work consists of:—No. 1 Level, 264 feet of incline shaft from surface on vein; No. 2 Level, 990 feet driving, 375 feet cross-cutting, winzes 100 feet; No. 4 Level, 344 feet driving, 153 feet cross-cutting; intermediate levels from incline, 320 feet. Total, 2,546 feet. A waggon road has been built from the mine to connect with the Toby creek road, a distance of about 8½ miles. The property is being systematically developed; a contract has been let to drive another 1,000-foot tunnel, and it is expected to ship 1,000 tons of ore this winter.

SPRING CREEK.

The *Silver Belt Group*, owned by the Silver Belt Mining Co, has been idle for some time. The development work consists of a shaft sunk 35 feet and a drift of 40 feet run from the bottom of the shaft, as well as two shafts of 10 and 30 feet. The ore is high-grade galena, and the one shipment made to the Trail Smelter averaged 218 ounces of silver to the ton.

The *Shamrock Group*, consisting of six claims, is in Paradise basin, adjoining the *Paradise*. Development work consists of open cuts.

The *Silver Crown Group*, on the *Silver Belt* lead, has a good surface showing. Development work consists of a 200-foot tunnel and open cuts.

On the *Nick of Time* and *Well Done*, situated in Paradise basin, nothing more than assessment work has been done, as also on the *Silver Link*.

The *Monarch Group*, consisting of three claims, has a well-defined lead cross-cutting the formation, with an average width of about 8 feet. The paystreak is about 5 inches, and is said to assay from 300 to 400 oz. in silver, 12 per cent. copper, and $3 in gold. Development work consists of 225 feet of tunnelling and some open cuts, also good substantial cabins.

The *Charlemont Group* consists of four claims, and is situated on the south side of Toby creek. The formation is lime-schist, alternating with slate, quartzite and limestone. Traversing the entire length of the group is an immense quartz vein, showing considerable mineralisation, but the ore so far has been principally found in smaller veins running parallel and about 200 feet from it. The *Charlemont* shows a small fissure vein about 18 inches wide, which has been stripped for about 400 feet and shows ore for about 200 feet. There is an open cut 10 feet deep, also an open cut and shaft 20 feet deep, both showing ore, which is galena and gray copper, carrying about 100 oz. in silver, 33 per cent. lead, 5 per cent. copper, and $2 to $4 in gold. On the *Carbonate* there is a three-foot lead, carrying galena and lead carbonates, following a slate and lime contact. This has been shown up for about 300 feet by open cuts. Lying parallel to this showing and about 100 feet from it, is a body of concentrating galena and lead carbonates from 4 to 10 feet wide, and on the *Lucky Two* there are about 18 inches of galena and carbonates.

On the *Black Diamond* the paystreak averages 11 inches of solid ore. Development consists of a 30-foot tunnel and an open cut. The ore assays 43 ozs. in silver, 58 per cent. lead, 6.3 per cent. iron, 14.0 per cent. silica and 40 per cent. zinc.

On the *Mineral King* considerable development work has been done some time ago with good results. The ore assays 50 ozs. in silver and 75 per cent. lead.

On the *Bullion Group* the lead averages 20 feet in width, carrying about 3 feet of ore on each wall. The ore is galena carrying gray copper and gold, assaying 75 to 80 per cent. lead, about 80 ozs. in silver, and from a trace to $12 in gold. The country rock is a dark slate.

On the *Monitor*, *Buttercup*, *South Side* and *Hot Boy* considerable work has been done and Crown grants are to be applied for.

The *Delphine Group* has been idle for some time past. A sleigh road has been built from the mine to connect with Toby Creek waggon road, and 80 tons of high-grade ore, which was in the bins, was hauled down the river. The property has lately been leased and work recommenced. The *B. C.* and *Chilberry*, situated near the *Delphine*, carry similar ore.

The *Lenora Group* consists of three claims. The ore is a high-grade chalcopyrite carrying silver values and a good deal of work has been done, the vein being uncovered for 800 feet.

On the *Kootenay Queen* and *Hot Punch Group* only assessment work has been done this year.

From the *M. T. Fraction*, situated on the North Fork of Toby creek and adjoining the *Delphine*, some 30 tons of ore were shipped last winter, giving the following results:—8,042.62 ozs. silver, 3,649 lbs. copper, transportation and treatment, $391.18. Net value of ore, $4,025.55.

On the *King Solomon Group* considerable work has been done with encouraging results, the ledge showing strong evidence of permanence and strength.

The work done on the *Outcrop Group* this season shows good results.

The *Duchess and Nickel Plate Group* is situated on Dutch creek. The ledge averages 12 feet in width, the ore being chalcopyrite, assaying on an average 25 per cent. copper and from $4 to $10.75 in gold. Development work consists of a 30-foot tunnel and numerous open cuts.

The *Alice* is situated on Law creek. The paystreak is said to be 14 inches wide, assaying 70 ozs. silver and 70 per cent. lead. The claim was Crown-granted this year and the development work looks promising. The lead stands almost perpendicular in a lime formation.

On the *Iron King* and *Iron Queen* the ledge is 10½ feet wide. Development work consists of a 50-foot tunnel and numerous open cuts, the ore assaying 50 ozs. in silver, 50 per cent. lead and $7.50 in gold. The ledge is on a contact between black slate and lime.

Although there are several promising claims on Boulder creek, the work has been confined to assessments only during the past season.

The *Silver Thread Group* (Law creek) consists of three claims in a formation of limestone, slate and porphyry. The ledge is about 5 feet wide, carrying galena assaying 70 ozs. in silver and 60 per cent. lead. Development work consists of about 80 feet of tunnelling and numerous open cuts.

The *Tecumseh Group* consists of three claims, adjoining the *Iron Cap*. The paystreak averages 20 inches of solid ore, assaying 150 ozs. in silver and 70 per cent. lead. Development work consists of a 40-foot tunnel and several open cuts.

Ptarmigan Mines.

A force of from 25 to 40 men has been continuously employed on this property, known formerly as the *McDonald* or *Red Line* mine. During the past year work was chiefly confined to the development of the *Red Line* vein. The ore in this ledge is a high-grade grey copper associated with iron pyrites, lying between serpentine and quartzite formation. The development on the *Red Line* consists, in addition to that of last year, of a 365-foot tunnel; 50-foot winze; a level 70 feet long from the 50-foot level of the winze; No. 1 upraise, 115 feet from mouth of tunnel, 79 feet, connecting with the surface; level 120 feet long from the upraise No. 1, 50 feet above the tunnel level; upraise No. 2, 230 feet from mouth of tunnel, 35 feet. Owing to the hardness of the rock, but slow progress could be made, and the Company decided to install a 4-drill compressor plant, which is now working. The waggon road was extended one mile to the compressor site, situated 8,000 feet from the mine, to which latter the air is carried by a 5⅝-inch pipe. The Company has also erected a saw-mill, with a capacity of 8,000 feet per day, and an aerial tram is under construction to convey the ore to the end of the waggon road. Three car-loads were shipped last season, and ore is now being hauled to the Columbia river for shipment as soon as navigation opens. Work was discontinued on the *Iron Cap*, owing to the low price of silver and lead.

Among other properties worked by this Company is the *Silver King Group*, a tunnel having been driven 259 feet.

There are several other properties in the vicinity of the Ptarmigan mines, viz:—the *Kentucky Group*, *Isabel Group*, and *White Elephant Group*, but little more than assessment work has been done so far.

The *Silver Treasure Group* consists of two claims located on Taylor creek and about 3 miles from the waggon road. The ore is found in quartz, in a lime schist, and accompanying an enormous quartzite dyke, following through the country across the *Ptarmigan* property, to which the ore is very similar. By tracing the quartzite dyke and prospecting closely, bodies of iron ore, with gray copper occurring in them, can be found for the entire length of the group, and assays from ore taken in a tunnel which is being run into the ledge, giving a depth of 150 feet, have been obtained as high as:—gold, $21; silver, 65 ounces; copper, 6 per cent. Development work will be pushed throughout the winter and the ore shipped out.

The *Virginia Group* consists of three claims, situated about 7 miles from the end of *Horse Thief* waggon road. There are two distinct ledges running through this group, one a quartz lead 15 feet wide, carrying bunches of gray copper and coarse cube galena, from which assays have been obtained up to $27 in gold, 320 ounces in silver, and 60 per cent. lead. The other lead is 4½ feet wide, with 10 inches of solid ore, the two leads being about 30 feet apart. Development work consists of several open cuts.

The *Juneau Group* is situated farther up the creek than the *Virginia Group*. Considerable work was done this season with very encouraging results, showing a good average shipping ore of galena and grey copper.

On the *Phoenix Group* of four claims development work consists of a tunnel 225 feet long, a 30-foot shaft and 40 feet of drifts. The ore is grey copper and galena. The claims have been surveyed and Crown grants applied for.

The *Paystone Group* is a copper-gold proposition, the lead averaging 8 feet in width; only assessment work was done this season.

The *Lead Queen Group* consists of five claims, and is situated about 18 miles from the Columbia river, on No. 3 creek. The development work consists of a 160-foot cross-cut tunnel, which tapped the lead at a depth of 120 feet. A drift on the lead about 50 feet showed 2 feet of solid ore from which a trial shipment of about a ton was packed out and proved satisfactory. A 40-foot tunnel was also driven on the *First Effort*.

The *Evelyn Group* of 3 claims is situated in the same vicinity; considerable work has been done and with good results. The ore is steel and cube galena, assaying well in silver and lead, the paystreak being 6½ inches wide.

The *Steele Group* adjoins the *Lead Queen Group* and is a continuation of that lead, averaging 9 feet in width. Development consists of a cross-cut tunnel 40 feet, tapping the lead and showing 2 feet of solid ore. The lead has been stripped for several hundred feet and is a good average shipping ore. It is expected that a sleigh road will be built to this camp in the near future, which will materially reduce the cost of transportation.

The *Bunyon Group* of four claims is situated about 4 miles from Windermere lake. The ledge is very wide and carries grey copper with silver values. The development work consists of one tunnel of 75 feet, one of 20 feet, a cross-cut 30 feet, and two shafts of 16 and 20 feet.

Office Statistics—Windermere Division.

Free miners' certificates	107
Company "	1
Mineral claims recorded	89
Application for placer lease	1
Certificates of work	210
Certificates of improvement	20
Conveyances	68
Notices filed	46
Crown grants	12

NORTH-WEST KOOTENAY DISTRICT.

REPORT BY FRED. FRASER, GOLD COMMISSIONER.

I have the honour to forward my annual report of mining operations in the Revelstoke, Illecillewaet, Trout Lake and Lardeau Mining Divisions, for the year ending December 31st, 1902.

The year now closed has witnessed great improvements in mining operations, principally in the Lardeau and Trout Lake Divisions, brought about through the installation of machinery at some of the principal mines.

In the Trout Lake Division an aerial tramway and air compressor have been added to the *Silver Cup* mine, an air compressor to the *Nettie L*, and an aerial tramway to the *Triune*.

In the Lardeau Division, the North-Western Development Company has installed a power-house, generating electrical power, by which its Durkee drills are operated as well as its saw-mill. This Company has also an aerial tramway and a ten-stamp mill running. For the *Oyster-Criterian Group*, managed by W. B. Pool, an aerial tramway, air compressor and ten-stamp mill have been purchased, and the greater portion of this machinery is now on the ground.

In the Revelstoke Division, the advent of the steamer "Revelstoke" on the Columbia river, plying between Revelstoke and Downie creek, has greatly facilitated the opening up of that section; in fact, the results during the few months the boat was running far exceeded the expectations of the most sanguine. A great deal more would have been accomplished had the steamer been able to run earlier in the spring and later in the fall, which, unfortunately, she could not do, owing to obstructions in the river. These obstructions have, to a small extent, however, been overcome by recent improvements by the Dominion Government.

Placer Mining.

In placer mining French creek is again showing considerable activity, and for several miles from its mouth it has been leased to companies which are either actively engaged in working their properties or are making arrangements for the early development of their holdings.

On Camp creek, six leases have been granted and active operations have been going on since the issue of same. Operations here are by the hydraulic method, and very encouraging prospects have resulted from the working of the top gravels. Some three miles of flume and water ditch have been constructed, all preparatory work has been done for the thorough opening up of this channel during the coming season, and good results are looked for.

On Smith creek, the Duquesne Mining Company has carried on extensive operations, expending upwards of $100,000 in an endeavour to reach bedrock.

On McCulloch creek, a new company has taken over the leases known as the *Opir Bedrock Flume*, *Last Chance* and *Columbia* and I am given to understand that sufficient funds are now on hand to enable the Company to install machinery as early as possible.

Thus, it will be seen that the prospects for the coming year throughout the entire District are most promising.

REVELSTOKE MINING DIVISION.

Report of W. E. McLauchlin, Mining Recorder.

I have the honour to submit my annual report of mining operations in the Revelstoke Mining Division for the year ending December 31st, 1902.

The Division has witnessed steady development during the past season, owing to the plying of the steamer "Revelstoke" on the Columbia river above Revelstoke. Miners and prospectors got their supplies in much more conveniently this season, and a great deal of new work will be done next year in consequence.

Standard Group.

I am indebted to Mr. J. M. Scott for the following account of the *Standard Group*, which consists of 11 claims, owned by the Prince Mining and Development Company, Limited Liability, of Revelstoke. The property is situated 33 miles north of Revelstoke and about 6 miles west of the Columbia river. There have been upwards of 1,200 feet of work done on the group, which is a tunnelling proposition, and the ore has been cross-cut at a depth of 125 feet and drifts run either way. The ore is here from 5 to 6 feet in width and the vein has been intersected by a deep open cut, showing the ore 8 feet in width. The present plan of development consists in running a cross-cut tunnel to tap the leads, of which it is expected that the first will be tapped at a depth of 285 feet and the second at a depth of 500 feet. The tunnel is now in 300 feet, and it is expected that the first lead will be encountered in 120 feet more. The ore is copper pyrites, and analysis shows it to be self-fluxing and to require about 5½ tons of ore to make one ton of 60 % copper matte. It also carries values in gold and silver. Besides the two veins mentioned, there are three other copper leads on the properties and two leads of arsenical iron.

The *Ophir*, *Last Chance* and *Columbia* placer leases, on McCulloch creek, Big Bend, have been taken over and are being worked by the Revelstoke and McCulloch Creek Hydraulic Mining Company, which took out a considerable amount of gold before closing down for the winter.

Downie Creek.

I am indebted to Mr. J. I. Woodrow for the following information regarding Downie creek:—

To the north of Downie creek, in Standard basin and on Keystone and Goat mountains, there are some 50 claims located, including the *Shield Group*, while to the north-east of the same creek there are about 20 locations. About $20,000 are required to complete the trail to the forks of Downie creek and thence up the south fork of the stream to Standard basin and Keystone mountain. This would benefit the whole of this mineral belt, as the route down Downie creek would be the natural outlet for the ores of this section to navigation on the Columbia river, and it could easily be kept open throughout the whole year. The valley of Downie creek, which is from half to 1 mile wide and 20 miles long, contains excellent agricultural land, and, should a waggon road be built, would be rapidly taken up by settlers.

Office Statistics—Revelstoke Mining Division.

Locations	136
Certificates of work	114
Free Miners' Certificates	248
Bills of sale (mineral)	34
Bills of sale (placer)	12
Permissions	15
Water records	10

TROUT LAKE MINING DIVISION.

REPORT OF R. A. UPPER, ACTING MINING RECORDER.

I have the honour to submit herewith my report of the progress of the mining industry in the Trout Lake Mining Division for the year ending 31st December, 1902.

The Division has witnessed, during the past season, steady development of all the well-known properties, while a number of new locations have been made. The completion of the Arrow lake and Kootenay railway has been the means of opening up transportation for the mineral output and, in consequence, the mines have been able to make larger shipments to the smelters and also to get in machinery.

Silver Cup Mine.

The following is the report of the work done on the *Silver Cup* and *Sunshine* since 15th March, 1902, when the mines became the property of the present owners. Development—500 feet of levels were driven during the year. Ore mined—765 tons of ore were mined during the year, of which 277 tons were sent to the smelters. The gross contents were: Gold, 182.496 ounces; silver, 54,798.6 ounces; lead, 144,770 pounds, the gross value being $31,121.79. Machinery—An aerial tramway from the mine to the waggon road on the south fork of the Lardeau river is in course of construction, and as soon as it is completed an air compressor and 60 h. p. boiler will be erected at the mine.

Nettie L. Mine.

Development:—1,100 feet of levels and 130 feet of raising and sinking have been done during the past year. Ore mined:—1,021 tons of first-class ore were mined, of which 528 tons were sent to the smelters, containing gold, 95.1 ounces; silver, 85,590 ounces; lead, 232,452 pounds; the gross value being $46,006. The railway, freight and smelter charges amounted to 33 % of the gross value of the ore. Machinery:—A 14″ x 14¼″ x 18″ Ingersol-Sergeant air compressor and a 60 horse-power boiler were erected during the latter part of the year and are now in full working order. Development work is being pushed rapidly forward and prospects to date have been most encouraging. Thirty men are now employed in this mine.

Ethel Group.

This group, comprising the *Ethel*, *Esther*, and the *May-Day* claims, is situated on Ethel mountain, overlooking the town of Trout lake, and after lying idle for four years, was purchased in October last by a syndicate of Philadelphia mining men, who immediately placed a force of 12 men on the property, and began extracting ore and driving a cross-cut tunnel to develop the vein at a greater depth. The work done on the vein to date shows a body of low-grade silicious ore. The entire length of tunnel is 90 feet of an average width of 5½ feet. Assays give 40 ounces of silver, besides which several small stringers of high grade chlorides and carbonates regularly occur and will bring the average value up to between 50 and 60 ounces. A shipment of 480 sacks was made to Trail smelter, and gave 215 ounces of silver per ton. The cross-cut tunnel is now in 125 feet and is expected to intersect the vein at 350 feet, at a vertical depth of 500 feet below the upper workings. If the ore encountered on this level proves to be of same value and character as above, it is the intention of the Company to construct an aeriel tramway and reduction works on the shore of Trout lake this coming summer. Geo. W. Stead is the local representative and general manager of the Company.

Lucky Boy Group.

This group consists of the *Lucky Boy*, *L. B.*, *C. H.*, *X. Y. Z.* and *Blue Jay*. The property was bonded early in December by the Company owning the *Ethel*, and a first payment of $5,000 made. A force of three men was put to work at once driving a short cross-cut tunnel to tap the vein, which was struck at 38 feet in, showing up 6 inches of very high-grade galena and grey copper ore. Since this

15 feet have been driven on the vein, the ore body still holding its size and value. As soon as additional supplies can be got in the force will be increased and shipments made.

Pedro and Minnie.

These claims are situated on Canyon creek and owned by the Marie-Marilla Mining Company. During the year, 300 feet of tunnelling and also comfortable cabins have been built. The average force was 10 men. Ore shipments of 5 tons were made to Trail smelter, averaging $96.50 per ton.

The *Mohican* claim is owned by a company of the same name, and during the year 150 feet of tunnelling has been done and about 100 feet of open cuts and surface work performed. The average width of ore is 3 feet. Assays give 80 ounces in silver and about 10 % lead.

The *American* claim is situated at the head of Haskins creek and is owned by the Mountain Lion Mining and Development Company, Limited. A cross-cut tunnel of 605 feet is now being driven to tap the vein at a vertical depth of 800 feet. Seven men are at present employed.

The *Yamhill* is situated on Abrahamson creek. During the season 270 feet of a tunnel have been driven and it is expected that work will be resumed in the spring. The average value of the ore is $34.

Triune.

The *Triune* is situated on Triune mountain and is owned by the Metropolitan Mining and Development Company. About 400 feet of development work have been done, consisting of drifts and upraises. The ore shipped during the year amounted to about 90 tons, with an average value of 245 ounces of silver and 36 % lead. A force of 16 men is employed on this property.

Maggie May Group.

This group is situated near the mouth of Tenderfoot creek and is owned by the Lardeau Valley Mines Company, Limited. The *Maggie May* has a lead of about 14 feet wide, carrying 2 feet of solid galena, averaging from $50 to $90 a ton. About 65 feet of a tunnel have been driven and also a considerable amount of prospecting work done. On the *John L* claim of this group a tunnel of about 112 feet was driven on a quartz lead about 13 feet wide. The ore chute is 3 feet wide and has been opened up for 60 feet. The average assays were 1 to 4 ounces in gold, the values occuring in iron pyrites and zinc.

The *North Star*, on Rapid creek, is a free gold proposition, belonging to Rogers and Smith, of Trout lake, and was located last fall. A tunnel of 120 feet has been driven, cross-cutting three leads. The average assays are $59 in gold.

The *Cromwell Group* is situated about nine miles north-east of Trout Lake City and consists of six claims. It is owned by S. Graham, B. Fowler, J. Grant and E. Baillie, and has been leased on a working bond to W. Davis, of Nelson, on behalf of the Myee Exploration Company. The tunnel is in about 90 feet in hard quartzite and is to be continued for 600 feet, when it is expected to strike the lead at a depth of 200 feet. Another tunnel has been driven in higher up on the lead, and shows a face of 5 feet of solid ore. Assays give $40 in gold. Five men are employed.

On the *Fidelity Group* a cross-cut tunnel has been driven about 200 feet, cutting one vein of about 18 inches of carbonates and solid ore, besides several stringers of solid ore ranging from 3 to 7 inches in width. There is another vein of mineralised quartz on the property, which has not yet been cut; this has a width of about 12 feet.

The *Spyglass* is situated on Poplar creek and is owned by J. Winquist. It contains some of the highest grade ore in the Lardeau, assays having given 3,740 ounces of silver and $120 in gold, to the ton.

OFFICE STATISTICS, TROUT LAKE DIVISION.

Free miners' certificates	273
Mineral claims recorded	196
Certificates of work	557
Mining receipts, general	672
Certificates of improvement	9
Special free miner's certificate	1
Bills of sale and agreements recorded	213

LARDEAU MINING DIVISION.

REPORT OF GEO. SUMNER, MINING RECORDER.

I have the honour to submit herewith my report of progress in the Lardeau Mining Division for the year 1902. Since my last annual report I am happy to say that the Fish Creek District has advanced very materially, a good deal of activity is apparent, and a very hopeful spirit as to the future pervades this camp. During the past summer several of our well-known free-milling gold properties passed out of the hands of the original locators and were taken over by companies which are carrying on development work with energy, and in some instances are preparing to install machinery.

Eva Group.

The Eva and *Cholla Groups*, comprising 18 claims and fractions, all Crown-granted with the exception of the *Joker*, have been worked for the past 3 years by the Imperial Development Syndicate, Limited, and have recently been sold out to the Calumet and B. C. Mines, Limited. The latter Company is preparing to put in a stamp-mill and wire cable tramway, together with machine drills. Pool creek flows through the claims and furnishes ample water power for all purposes. The ore is free-milling and of a low-grade, with chutes of higher grade ore. Work has been confined almost entirely to the *Eva*, and the following is a detailed statement of the development on that claim to date :—

No. 1 tunnel and cross-cuts	320 feet.		
" 2 " " "	96 "		
" 3 " " "	355 "		
" 4 " " "	140 "	Winzes	113 feet.
" 5 " " "	80 "	Winze	80 "
" 6 " " "	520 "	Raise	30 "
" 7 " " "	40 "		
East drift	109 "		
West drift	20 "		
Surface shafts	120 "		

The following is from a report of Mr. E. A. Haggen on this group :—

The property is distant from Cambourne two miles by trail, the camp being at an elevation of 1,500 feet above Fish creek and 3,110 feet above sea level, the upper workings being 500 feet higher. The ore is free-milling and the exact occurrence of the ore body has not been fully determined, although there is evidently a large area of mineralisation. The development done may be briefly summarised as follows :—

At the summit of Lexington mountain, at an elevation of 3,590 feet and on the boundary of the *Eva* and *Highland Mary*, a drift was run on the supposed outcrop of the lead and

showed it was not in place but an over-throw. The ore here carries considerable sulphurets and free gold. At an elevation of 3,410 feet an open cut (No. 3) was made in ore for 11 feet without reaching the west wall. Average assays from this cut were $7.50 per ton, the values being in free gold. To the west of the last-mentioned another cut 40 feet long was made in ore, so that the vein here would appear to have a width of at least 40 feet, assays being $20 per ton for the first 10 feet; $15 per ton for the next 20 feet, and $5 to $6 for the remainder. At this point an incline shaft was sunk for 50 feet, samples giving $13.80 in gold, and from the bottom of the shaft a cross-cut was made for 34 feet N. 20° W., assays running from $10 to $3, sulphurets showing strongly in the first 14 feet, the next 10 feet being in quartz well mineralised and the remainder in schist with quartz stringers.

Below the cut mentioned (No. 3) and on the same lead, a tunnel (No. 6) has been driven 300 feet on the foot-wall, which is well defined and almost vertical, with a good gouge. Assays from this tunnel vary from $3 and $4 to $6 and $8 per ton. Fifty feet in, a cross-cut has been run for 30 feet, the first 15 of which are in quartz, passing into quartz and schist. At 100 feet in, another cross-cut has been run for 27 feet in quartz, with schist coming in towards the face, while 46 feet farther on is a third cross-cut, which is for 14 feet in solid quartz, and then runs into schist, both quartz and schist being impregnated with sulphides. Beyond this the dip of the wall changes to 82 ° S. W., and at a further distance of 67 feet is a fourth cross-cut 90 feet long, cutting a body of quartz 4 feet wide and assaying $4 to $8 per ton. A drift was made on this body for 74 feet, from the face of which a cross-cut of 20 feet was run and exposed a well-defined wall.

Another tunnel (No. 4) has been driven for 70 feet, at an elevation of 3,230 feet, on a series of stringers, assays averaging $15 to $20. Above the mouth of this tunnel there appears a quartz exposure, assays on which give $20 in gold per ton.

At 3,160 feet elevation another tunnel (No. 5) has been driven, with a cross-cut of 32 feet at the face. At 45 feet in a winze of 50 feet has been sunk on the wall, connecting with No. 6 tunnel. The wall is well-defined with a rich paystreak 3 feet in width (assays have given $63). This tunnel was driven on a face of quartz exposed for 25 feet on the mountain side, and traceable upwards for 300 feet, assays taken across the face giving values of $13.50 to $15 per ton.

Below the last-mentioned, No. 3 tunnel was run for 300 feet and cut, at 80 feet in, a well-defined wall, which it followed. A chute of ore was exposed, assays on which gave $30 per ton. An upraise was made to connect with the winze previously mentioned, a cross-cut run at 110 feet in, showing a width of 10 feet of ore, while at 140 feet in a winze was sunk for 67 feet and is being continued, and two other cross-cuts have been made at 175 feet in.

There is good water power available and the mining facilities generally are excellent.

Cambourne Group.

This group of 9 claims is being operated by the North-western Development Syndicate, Limited, head office, Hancock, Mich., U. S. A., with registered office at Nelson, B. C., and mine office at Goldfields, B. C.; president, A. J. Scott; secretary, M. R. Goldsworthy, Hancock, Mich.; managing director, H. Brock, Goldfields, B. C. Eight of the claims the company holds under bond; the ninth, the *Goldfinch*, having been purchased last July. The property comprises about 317 acres and extends for over a mile in length. The following is taken from the manager's report to the directors:—

"Instructions were given to thoroughly prospect the property in the shortest possible time, with adequate equipment. It was, therefore, decided to instal a power plant and electric drills. A dam was constructed in Menhinick creek, 18 feet high and 30 feet long. A flume, 500 feet long, brought the water to an elevation of 1,700 feet above the power house, in which

was located a 4-foot Pelton wheel and a 50 K. W. 110-volt dynamo. The water was brought from a sand box at the end of the flume to the power house, by 350 feet of 14-inch steel pipe, slip joint, and acts on the wheel by a 3½-inch nozzle, developing about 70 horse-power. The dynamo is about the same power and furnishes the current to work the electric drills; these are Durkee drills and are operated by a 2½ h. p. motor, connected by a flexible shaft. Work was begun on June 5th. Two and one-half miles of road and several bridges had to be constructed to get the machinery on the ground. Timber for the flume cost $78 per M. delivered on the site. The electric drills were installed at once and have been in operation till December 1st. They proved a success when properly handled and will drill as fast as any drill in from medium to soft rock, having the advantage of being easily changed from one place to another at a distance, in a very short time. In medium rock these drills will average 50 feet of holes per shift, finishing 2¼ inches. In hard rock they are not failures, but will not make the same progress that air drills will.

"In prospecting these claims it was thought advisable to cross-cut the formation every 500 feet to the strike of the showing on the *Goldfinch*. Tunnels 1, 2, 3 and 4 were completed without finding any rich bodies of ore, but large bodies of quartz, carrying about $3 per ton, were encountered in Nos. 3 and 4. The overflow from the flume stripped and exposed a fine quartz vein to the south of Menhinick creek, and a tunnel was driven on this lead for a distance of 130 feet, all in quartz, giving values of $2.80 to $3.20 to the ton. Altogether, on the lower claims, there have been driven 903 feet of tunnels up to December 1st. These tunnels are 5 x 7 feet and require but little timbering.

"On July 2nd the Company bought, for $25,000 cash, the *Goldfinch* claim, immediately adjoining the upper claims, and on which there was a rich showing of free milling quartz. On this claim little work has been done except assessment, comprising 40 feet of tunnels and 400 feet of open cuts, exposing the vein for about 600 feet, all of which shows the high values that were first encountered. There are now two tunnels being driven to the strike of the *Goldfinch* lead, one a depth of 200 feet and the other 100 feet from the surface, but 300 feet nearer the surface showing. We expect to reach the lode some time in January. These tunnels are of sufficient depth to prove the character of the vein at depth. The lower tunnel is now in 31 feet and the upper one 10 feet. The manager's instructions being to develop this claim at once, it was deemed necessary to have a mill test in order to determine the method of treatment and value of ore. This mill test was made at the Granite mill, near Nelson, with the following results:—

"Feeder sample assayed	$44.00 per ton.
Value of concentrates	207.20 "
Gold bullion recovered	25.63 ounces.
Percentage of total values saved by amalgamation	83.07 per cent.
Percentage of total values saved by concentration	4.7 "
Total recovery	87.77 per cent.

"The rock for the test was not selected, but was taken from the dump and gives a fair test of rock on the surface. With about 1,000 tons of ore of this quality in sight, it was deemed advisable to erect a ten-stamp mill near the power-house and a tram-line from the *Goldfinch* to the mill; also to erect a saw-mill for the Company's use. A contract was accordingly let on July 27th for a stamp-mill, aerial tram and saw-mill. The saw-mill began cutting on September 20th. The aerial tram is now ready for the cables, which are on the ground, and the stamp-mill buildings are being erected. It is expected that this machinery will be running early in the year.

"The Company is provided with good substantial buildings, as follows:—Power-house, 32 x 52, boarding-house, bunk-house, office, blacksmith shop, store-house, power-house, saw-mill, stamp-mill, and ore bins are in course of erection. At the *Goldfinch*—Bunk-house, boarding-house, blacksmith shop and ore bins. Owing to the accounts being in the East and statements being lost in the mail, only an approximate cost of the plant and expenditure can be given:

"Amount paid on property	$72,000
Machinery, duty and freight	32,000
Labour	30,000
Supplies	20,000
Total	$154,000"

Oyster-Criterion Group.

This group consists of the *Oyster*, *Criterion*, *Mascotte* and *Mascotte Fraction* claims, situated adjoining the *Eva Group*. The property was purchased by the Ophir-Lade Syndicate last summer from the original locators, and since the date of purchase over 1,000 feet of tunnels have been driven, exposing large bodies of variously graded free-milling gold ore. The company has purchased a stamp-mill, wire tramway, compressor plant and power drills, all of which are on the road to the mine at this writing. The mill will be situated on Pool creek, from which power will be obtained. The plant purchased is said to be modern in every detail. A dynamo has also been purchased for lighting purposes.

Beatrice Group.

This property is now being worked by the Beatrice Mines, Ltd. A considerable amount of supplies were packed in last fall in order to keep a large gang of men working on the property during the winter. This was considered essentially a galena property, but last summer a large ledge of free-milling gold ore, which assayed very favourably, was uncovered. The principal work is being done on the galena showing, a tunnel being driven 400 feet to tap the surface showings at depth. The gold ledge is also being opened up. A number tons of galena ore have been shipped from this property, taken from wherever it could be most easily mined. Before being shipped it was carefully hand-picked, as the difficulties of transportation were enormous. A considerable quantity of ore still remains on the dump awaiting better transportation facilities. A cable tramway is being talked of from the mine to Cambourne.

The *Lucky Jack Group* is situated adjoining the *Eva*, *Oyster* and *Criterion Groups*, the leads of these latter being expected to go through this property. The owners, W. J. Butler, Owen Rowland and John Deroce, are working steadily, and it is probable a company will be formed next summer to take over this valuable property. A water grant of 300 inches from Pool creek is appurtenant to the property, and the owners have secured a very good mill site. Considerable work has been done, but I am not in a position to give full particulars of the same.

The *Wide West* has had about 200 feet of tunnel driven on it during the season. I am informed that work will be resumed next spring. There are now 511 feet of tunnel on this property.

The *Western Star Group* consists of two full claims and a fractional claim. Work was commenced upon this property on the first of August, 1902, and consists of three tunnels, all of which are being driven upon the lead, the total number of feet to date being 211. Four men are to work this winter and will remain until spring, when development will be pushed forward upon a large scale.

Lardeau Mines, Limited.

The property of this company is situate on Lexington creek, and consists of four full claims. There are four separate veins on the property, one of which is free-milling gold quartz. A tunnel is being driven to tap the latter at depth. It is in now a distance of 140 feet. A small force of men are working this winter.

OFFICE STATISTICS, LARDEAU MINING DIVISION.

Free Miners' Certificates	224
Mineral claims recorded	255
Placer claims recorded	11
Certificates of work issued	362
Conveyances, etc.	204
Claims Crown-granted	16
Abandonments	7
Permissions to re-locate	4

SLOCAN DISTRICT.

REPORT OF E. E. CHIPMAN, GOLD COMMISSIONER.

I have the honour to submit my report on the Slocan District for the year 1902.

The continued low price of lead, and the very great depreciation in the value of silver have had a depressing effect on the mining industry in this District during the past year. In consequence of this, many of the mines are closed down, or are employing a greatly reduced force. Development, however, has been fairly well kept up, and nearly all the claims have been represented. A larger number of properties have been Crown-granted than ever before in a single year in this District, the number reaching 139, while 168 certificates of improvement have been issued.

A new feature for encouragement is found in the opening of a market for zinc ores. Formerly, zinc in the silver-lead ores in the Slocan was a detriment, the smelters having exacted a penalty for its presence. The ore is now being sought after by the American zinc smelters, and prices are being paid for it which will enable the shippers to realise a profit on a commodity they had looked upon as being not only worthless but injurious. A number of mines, notably among them the *Payne*, *Ivanhoe*, *Slocan Star* and some others, have availed themselves of this new market by shipping a considerable quantity of the ore to Iola, Kansas, where it is being treated. Preparations are also being made to re-model some of the mills, for the better separation of the ores, and it is reported that a number of other mills will be built, during the coming summer, for the proper and more economical handling of the product.

SLOCAN MINING DIVISION.

REPORT BY ANGUS MCINNES, MINING RECORDER.

I have the honour to submit herewith my annual mining report and office statistics for the Slocan Mining Division for the year ending December 31st, 1902. I am pleased to state that although the silver and lead markets have been lower than ever before in the history of the District, yet a great many of the mines have done a considerable amount of development work, and have shipped a good quantity of ore, as shown by the details of the different properties herewith.

Payne. Upon the Payne Mining Company's property, since my last report, a large concentrator has been built and has been running for the last five months to good advantage. The average number of men employed during the year was 60, some 1,700 tons of lead ore and a considerable amount of zinc having been shipped, while 1,054 feet of tunnelling were run, with 513 feet of winze and upraise. The mine is managed by O. C. Garde.

The *St. Kevern*, also managed by O. C. Garde, employed on an average four men during the year, 7 tons of ore having been shipped and 459 feet of tunnel driven, with 47 feet of upraise and winze. The operations were suspended a short time ago.

Slocan Star.

This well-known mine has, during the year, been working with a reduced force, owing to the unfavourable state of the metal market, the average number of men employed being 27. The ore shipments amounted to over 1,300 tons and there were 2,530 feet of tunnelling driven, including upraises and winze. The property is under the management of Oscar V. White.

Monitor Group.

This group of mines is situate near Three Forks, and consists of *Monitor No. 2* (48.74 acres), *Hustler Fraction* (28.40 acres), *Portland No. 2* (41.17 acres), *Friday Fraction* (18.13 acres), and *Keewatis* (46.68 acres). The proprietor is an English Company operating under the name of the Monitor and Ajax Fraction, Limited; capital, £55,000. It acquired the *Monitor* and *Hustler Fraction* in September, 1900, from Messrs. Petty, Harrop and others, for the price of $125,000; the other properties have been acquired more recently.

The position of this group, traversed as it is by the branch line of the Canadian Pacific Railway, is perhaps the most advantageous of any in the District for cheap and rapid exploitation. Since the beginning of operations by the present owner, 3,257 feet of tunnelling and raises have been driven, with an average crew of 22 men, and 1,620 tons of ore were mined and shipped to the smelter, producing the following values:—Gold, 504 ozs.; value, $9,610.55; silver, 177,713 ozs.; value, $91,856.03; lead, 1,119,903 lbs.; value, $15,242.50; total in all values, $116,712.08. The tonnage of ore blocked out and ready for stoping amounts to over 3,000 tons. The ore is an argentiferous galena, with this characteristic, that it carries high values in gold. The ledge has been explored on the *Monitor* and *Hustler Fraction* only, but it is apparently certain that it traverses the *Portland*, *Friday Fraction* and *Keewatis*, as float ore has been found on and below the last-named property. The ground above the *Monitor* being covered with heavy timber and wash makes prospecting for the ledge from the surface inadvisable. The property is under the management of Mr. Maurice Gintzburger.

American Boy.

The *American Boy* is situated near Sandon, and employs 17 men. During the year 1,182 tons of ore were shipped, and 280 feet of tunnel driven, with 790 feet of upraise and winze, and 300 feet of cross-cut tunnel. The property is managed by Thomas McGuigan.

The *Reco* has, during the year 1902, shipped 536 tons of very high-grade ore; the average number of men employed was 15, and 500 feet of tunnel have been driven, together with 250 feet of upraise and winze. John M. Harris has managed this mine since 1892.

The *Queen Bess* has employed 8 men on an average, and has shipped 295 tons of ore; 305 feet of tunnel and 434 feet of upraise and winze have been driven. The property is managed by W. G. Scott.

The *Slocan Boy*, under the management of J. L. Retallick, has, during the year, employed 6 men on an average, and shipped 200 tons of ore; 500 feet of tunnel and 200 feet of upraise and winze have been run.

The *Red Fox* employed, during the year, an average of 10 men and shipped 164 tons of ore of good grade. Some 675 feet of tunnel and 425 of upraise and winze have been driven, 200 feet of open cut work done in the way of prospecting, and 300 lineal feet of stoping. This mine is under the management of George H. Aylard.

At the *Hartney* four men have been employed doing development work, and have driven 270 feet of tunnel with 20 feet of upraise. The property is managed by W. S. Drewry.

The *Mercury* (also managed by W. S. Drewry) has employed 3 men during the year, shipped 21 tons of ore, and driven 110 feet of tunnel. The work here has been principally development.

The *Hewett*, situated near Silverton, has worked a force of 18 men, shipped 784 tons of ore, and run 905 feet of tunnel and 335 feet of upraise and winze. It has now been closed down for the last two months.

The *Last Chance* (L. Pratt, manager), situated near Sandon, has shipped 249 tons of ore during the past year, and run 300 feet of tunnel, with 250 feet of upraise and winze. On an average 10 men are employed.

The *Capella Group*, situated near New Denver, on Goat mountain, is managed by W. R. Wills, who is half-owner of the property. On an average 5 men have been employed during the past year, 50 tons of very high-grade ore shipped, and 155 feet of tunnel, with 125 feet of winze and upraise, run. The mine has been closed for the last two months.

The *Freddie Lee* (L. Alexander, manager) employed 8 men, shipped 130 tons of ore, and 500 feet of tunnel and 200 feet of upraise and winze were run. This property has been also closed down since the 1st November, 1902.

On the *Bosun*, near New Denver (W. H. Sandiford, manager), a considerable amount of development work has been done during the year, 677 feet of tunnel and 162 feet of winze and upraise being made. About 1,300 tons of ore were shipped, 500 tons of which were zinc. The average number of men employed was 27.

The *Idaho* (W. S. Jenkins, manager) worked a force of 12 men, and although no ore was shipped, a large amount of development, comprising 1,500 feet of tunnel and shaft work, was done.

Marion (— Caldwell, manager). On this property there have been 2 men doing development work, and 150 feet of cross-cut tunnel have been run, in order to tap the ore-body at a greater depth.

The *Fisher Maiden* (Frank Watson, manager), situated on Four-Mile creek, has employed on an average 6 men, has shipped 120 tons of ore during the year and run 400 feet of tunnel.

The *Wakefield* mines, situated on Four-Mile creek, have been worked for the first six months of the year, and are under lease to Mr. F. Lane, of London, England; 5 men were employed, 200 tons of ore shipped and 150 feet of tunnel run.

The *Dardanelles* has had 3 men employed for the last five months doing development work.

The *L. H. Group*, situated on Red mountain, near Silverton, has had 2 men doing development work. This is a gold and copper proposition, giving very high values in the former.

I have been unable to obtain any information from the managers of the following properties: *Rambler*, *Antoine*, *Ruth*, *Soho*. The *Noble Five* has done very little this last year.

OFFICE STATISTICS—SLOCAN MINING DIVISION.

Free miners' certificates issued	480
" " " special	6
" " " company	12
" " " " special	2
Certificates of work recorded	407
Locations recorded	153
Certificates of improvements recorded	94
Cash paid in lieu of work	$500
Bills of sale and other documents recorded	140
Abandonments recorded	3
Water rights recorded	1
Traders' licence issued	44

SLOCAN CITY MINING DIVISION.

REPORTED BY H. P. CHRISTIE, MINING RECORDER.

I have the honour to submit my annual report on the Slocan City Mining Division for the past year.

On the whole, the development and general mining have been much the same as during the last two years, but have possibly shown up the District better than ever before. Several prospects are being developed into shipping mines and a good deal of activity was shown at the beginning of the year. Owing, however, to the low price of silver and other causes several of the principal mines closed down towards the end of the year.

SPRINGER CREEK.

The *Arlington* shipped 3,797 tons of ore, and work was carried on continuously with an average force of about 75 men. A mill for the more economical treatment of the ore is to be constructed immediately.

The *Speculator*, on the same lead as the latter, made a small shipment of ore and has undergone a fair amount of development.

The *Black Prince* has been bonded during the year and about 15 men have been working for 6 months. The ledge has been cross-cut and shows up well.

The *Two Friends*, adjoining the *Black Prince*, has been Crown-granted and acquired by a Nelson syndicate which purposes starting work in the spring.

The *Ottawa* has shipped 100 tons of ore. The property has been bought by Mr. Coleman, of Pittsburg, Pa. A force of 15 men has been employed for four or five months and the claim is showing up well under development.

The *Republic* has been bought by Detroit capitalists, who have built a good waggon road to the mine and have worked a small force of about 12 men for some months. A good body of ore has been encountered and the first car-load was recently shipped.

The *Erin*, adjoining the *Republic*, is being worked by the owners and promises well.

The *Exchange* and *Silver Plate* have been bought by Detroit capitalists and are to be worked immediately.

The *Tamarac*, *Meteor*, *Cripple Stick*, *Hampton*, *Myrtle Group*, and a few other properties have all been worked a little during the year, and, on the whole, with promising results.

TEN-MILE CREEK.

The *Enterprise* has been working steadily all the year, and has shipped some 2,300 tons of ore.

The *Neepawa* was bonded in the early part of the year and was later worked by the owners, about 100 tons of ore being shipped.

The *Iron Horse*, adjoining the *Enterprise*, and supposed to be on the same lead, has been working steadily with a small force of men most of the year, and is looking well.

The *Mabon* and *Ohio*, in the vicinity of the *Enterprise*, are undergoing steady development by the owner, and are showing up some good ore.

The *Bondholder* has been worked under a lease for six months.

The *Kalispell* has been working a small force for some months.

TWELVE-MILE CREEK.

The *Paystreak* was worked a little and made a shipment of 5 tons.

The *May*, *Strathroy* and *B. C.* were bought by Detroit investors and a small amount of work done.

A good many other properties on this creek were slightly worked, but nothing of any consequence was done.

LEMON CREEK.

On the *Legal* 500 feet of tunnelling were driven, the ore chute being encountered at a vertical depth of 150 feet; assays give $20 to the ton, and the ore is free-milling.

There was rather less work done on this creek than usual, although the *Tailholt*, *Alberta*, *Hoodoo*, *Duplex*, *Fourth of July* and *Crusader*, besides others, were all worked, and several of them are showing up well under development.

OFFICE STATISTICS—SLOCAN CITY MINING DIVISION.

Certificates of work issued	495
New locations recorded	224
Transfers made	310
Crown grants obtained	21
Free miners' certificates issued	272

AINSWORTH MINING DIVISION.

REPORT OF E. E. CHIPMAN, GOLD COMMISSIONER.

In the Ainsworth Mining Division the progress has not been as satisfactory as it was hoped it would be a year ago, either in the amount of ore shipped or in development, although the latter has been more extensive than the prevailing prices or transportation facilities would seem to warrant. This state of affairs, however, evidences the complete confidence the owners have in their respective properties, and encourages the hope that when more favourable conditions obtain they will be amply rewarded for their efforts of the past year.

HAMIL CREEK.

The Argenta Mines Company has had a force of 7 men continuously employed during the year. Only development has been done, the ore taken out being merely an incidental of the work performed. At a conservative estimate, there are 27,000 tons of ore ready to be stoped out as soon as a road is built to enable it to be transported to the lake, and there are 80 tons on the dump. About 450 feet of tunnel have been driven at different elevations on the vein, and a contract has been let and is now being prosecuted to continue these tunnels a further distance of 500 feet.

The *Lavina-Butte*, just above and adjoining the *Argenta Mines* property, has had three men employed during the year on development work. Eighty-two tons of high grade silver-lead ore were shipped, but packing to the mouth of the creek was so expensive that it has been decided to defer future shipments until better transportation facilities are provided. There are already 3,000 feet of development work done on this property, and it is the intention of the management to prosecute work steadily during the coming year. In the surface tunnels the character of the ore is silver-lead, but in the lower workings, at a depth of 1,000 feet, the lead has practically disappeared, and is replaced by copper.

Farther up the creek, and joining the last-named properties, Mr. W. L. McLaughlan is the owner of a promising group of claims, upon which he has done 200 feet of work during the year.

The owners of the *Red Star Group* of claims, on Howser lake, have what they consider a valuable property, and, as an evidence of their confidence, they built 1½ miles of trail, put up buildings, and have driven 120 feet of tunnel during the year.

Work on the *Irene Group* of claims, on the Upper Duncan river, about 7 miles from Hall's Landing, was carried on continuously by a small force of men during the year. The development on this group consists of a cross-cut tunnel 260 feet long and 250 feet of drifting on the ledge. The owners intend putting on an increased force in the spring, as soon as supplies can be got in.

The *Golden Eagle* and *Arc Light* are two new claims on Gertrude creek, a branch on the west side of the Upper Duncan river, and were developed during the year by 120 feet of tunnels and open cuts. In the tunnel a body of ore has been exposed, carrying high values in gold, silver and copper. As soon as transportation can be provided, the owners expect to become constant shippers.

Woodberry Creek.

The Sloean Development Company has carried on work steadily in developing the *Tecumseh* and *Pontiac* claims. An average of six men has been employed. About 400 feet of tunnel have been run during the year, and a quantity of ore is now being rawhided to the lake.

The *Baltimore Group* has worked a force of three men since June. A shaft 50 feet deep has been sunk and a tunnel driven for 140 feet on the vein. Twenty tons of high-grade silver-lead ore taken out in the course of development have been shipped. The owners intend continuing the work steadily during the year.

The King Solomon Mines Company has employed a force of 3 men on the *Black Eagle Group*, and has driven 250 feet of tunnel, with very encouraging results.

About 50 feet of development work has been done on the *Grant*, another very promising property.

Ainsworth Camp.

The *No. 1* was under lease for a part of the year. Two men were employed, and 31 tons of ore were shipped. The mine is now being operated by the owners, who are employing 10 men in development, with a view to extensive work when conditions become more favourable.

The *Dollie* and *Little May* were under lease for three months, but closed down in June, since which time they have remained idle. During the lease 7 men were employed, 221 feet of drift run, 12 feet of shaft sunk, and 150 tons of silver-lead ore shipped.

Highlander.

The Highlander Mill and Mining Company employed 15 men on an average, principally in driving the main tunnel, which is now in a distance of 2,500 feet. Some drifting was done on one of the veins cut by the tunnel about 900 feet from the mouth, and a considerable amount of ore was taken out and is awaiting shipment when prices become more favourable.

The *Star* and *Sunlight* employed 2 men for the greater part of the year; 200 feet of tunnel were driven, 25 feet of shaft sunk, and 20 tons of ore were shipped.

Highland.

The Highland (Kootenay, B. C.) Mining Company's properties, situated on Cedar creek, were idle the greater part of the year, but work was recommenced in October, and 50 men are now employed; 460 tons of

concentrates were shipped in the months of November and December. The work since commencing operations consists of 60 feet of upraise, 210 feet of drifting, the rest in stoping.

South Fork of Kaslo Creek.

The *Bismarck* has employed during the year a force that will average 5 men, has shipped 150 tons of high-grade silver-lead ore, driven 150 feet of tunnels, sunk shafts, and done considerable surface development. Late in the year the owners opened up between the second and third tunnels a body of ore 2 feet in width, which, if it continues, will give very good returns.

The *Province* is employing 6 men in development work. The *Dublin* and *Cork* are also employing 9 men in development.

Revenue and *Birthday*, on Sturgis creek, one of the upper branches of the South Fork of Kaslo creek, are new claims of considerable promise, and were developed during the year by two tunnels, respectively 32 and 50 feet each. In the former a body of silver-lead ore has been exposed, 2 feet in width, averaging in values 250 ozs. of silver and 65 per cent. lead. The owners intend to prosecute the work steadily during the present year.

The *Silver Glance*, near Bear lake, has fully realised the expectations of its owners, and work has continued steadily since June 1st., 1902, 9 men being employed. The vein is developed by two tunnels, one above the other, nearly all on the ledge. During the year, both tunnels have been continued on the vein, and a shaft has been sunk from the bottom of No. 1 tunnel to a depth of 48 feet, all the way in ore. In No. 2 tunnel a winze has been sunk 38 feet, encountering ore the whole distance. About 150 tons of ore have been shipped during the year; it is a high-grade sulphide, carrying brittle silver and silver glance, with about $2 in gold per ton.

A considerable amount of work has been done on Coffee creek during the past summer, and it is beginning to be looked upon by prospectors as one of the most important parts of the District. A number of discoveries have been made which are believed to be of great value. The Stewart Bros. have a very encouraging group of claims, new discoveries of the year, and have about 20 tons of ore sacked and ready for shipment as soon as a trail can be built.

In the Whitewater camp, on Spring and Schroeder creeks, and on the Blue ridge a considerable amount of development work has been carried on, but nothing particularly noteworthy has been done.

Office Statistics—Ainsworth Mining Division.

Free miners' certificates (individual)	502
" " (companies)	13
" " (special)	7
New claims recorded	308
Trasfers recorded	193
Mining receipts issued	1321
Certificates of work issued	882
$100 paid in lieu of work	13
Surveys as work	36
Placer claims recorded	13
Water records issued	11
Pre-emption records issued	26
Certificates of improvement issued	173
Certificates of purchase issued	17

NELSON DISTRICT.

REPORT OF ROBERT A. RENWICK, GOLD COMMISSIONER.

I have the honour to submit the annual reports of the Nelson, Goat River and Arrow Lake Mining Divisions for the year 1902.

NELSON MINING DIVISION.

Mining in the Nelson Division fluctuated during the year 1902. The Hall Mining and Smelting Company suspended operations on the *Silver King*, but before the year had closed the unfavourable effect of this was in a very great measure removed by reason of the excellent results secured in the mine by the lessee, in less than 3 months' operations, the resumption of operations at the *Athabasca-Venus* properties, and the entrance of the *Wilcox* into the shipping list.

Of the lode locations recorded throughout the Division during the year the total comes within 30 % of the figures for the previous year. The hills in the vicinity of Nelson apparently received close attention, the claims staked upon them aggregating 170.

Some 40 claims were staked along the slopes of Grohman, Sproule, Bear, McGarrety and Falls creeks, which run into the Kootenay river a short distance below Nelson. The showings upon many of the locations were favourable.

Prospecting was fairly active in the vicinity of Ymir, there being close upon 90 claims recorded in the section drained by Quartz, Wild Horse, Porcupine and Hidden creeks. The North Fork of the Salmon river also received attention, there being 60 odd claims recorded along it.

Placer Mining.

Some placer mining excitement occurred along the North Fork of the Salmon river. This was in a measure due to the good luck of the Peterson Brothers who, while digging a well to secure drinking water, came upon placer gold in paying quantities. They staked the ground and were working some time before the rich nature of the discovery became known. After the secret was out there were over 35 claims staked in the vicinity, and with the locations made on Fifteen-Mile and other creeks the total number of claims recorded came up to 49. The best of the ground, including that held by the Petersons, was later acquired by a couple of companies, the Wild Duck Placer and North Fork Placer, and arrangements are being made to work on an extensive scale as soon as spring opens. On the Salmon and Pend d'Orielle rivers there were, all told, 8 placer leases granted.

HALL MINING AND SMELTING COMPANY, LIMITED.

During the last half of the year 1902 this Company confined its operations largely to the business of custom smelting of lead ores. The very comprehensive scheme of development which the Hall Mines Company had pursued in the *Silver King* mine aimed at the opening up of the property at the depth of 1,000 feet, but the results were so unsatisfactory in the lower levels that further work in the mine, on the Company's account, was suspended.

The Company's financial year ends with the 30th June, and the statement submitted at the last annual general meeting gave the loss upon mining operations at £6,980 16*s.* 8*d.* This was arrived at by writing off the sum of £19,571 16*s.*, which had been charged to the Company's development account during the previous year, as well as the further sum of £1,094 18*s.* 3*d.* from the value of the mine supplies. The output of the mine for the fiscal year was 22,661 tons, of a gross value of £66,179 5*s.* 4*d.*, which value, however, was reduced in the mine account by the charge of £19,456 13*s.* 11*d.* for crushing, tramming to the smelter and smelter charges. The shipments from the mine for the first six months of the calendar year 1902, which marked the close of the Company's mining operations, amounted to 5,302 tons, with a gross value of $54,368.49, and a net value of $25,855.79.

The Company's smelting operations during its last fiscal year were more encouraging, showing a net profit for the year of £5,071 19*s.* 3*d.*, which reduced the net loss shown in the Company's general account to £5,945 16*s.* 3*d.* Since the close of the Company's last financial year smelting conditions have become less favourable, due in a great measure to the unsatisfactory condition of the metal markets, and steps have been taken to secure relief for the industry through a re-adjustment of the Dominion tariff on imports of lead and manufactures of lead, and with every prospect of success.

During the calendar year there were treated in the Company's smelter 26,747 tons of lead ores, and 10,628 tons of copper ores. This produced 4,175 tons of bullion, valued at $961,854.69, and 946 tons of matte, valued at $178,311. During this period the No. 1 lead furnace was in blast 117 days, the No. 2 lead furnace 297 days, and the copper furnace 53 days.

The smelter furnished employment throughout the year for 130 men, and the pay-roll aggregated $120,000.

Following close upon the suspension of the Company's mining operations in the *Silver King*, a lease upon the mine was given to M. S. Davys, who during the earlier period of its development was employed by the Company as mine superintendent. The lessee commenced work in August, and, to avoid the expense of pumping, he is for the present confining himself to the workings on and above the No. 3 level, and below this the mine is now filled with water.

The results already secured by Mr. Davys amply support his contention that, while the mine may not be in shape to maintain a daily output of 200 tons, it is by no means a worked-out property. With a crew of 12 men the lessee, during the month of October, took out 200 tons of first-class ore, and during the months of November and December an additional 500 tons were mined and sent down the tramway to the smelter at Nelson. All of this ore was taken from the stopes left by the Company at the time it suspended operations. Owing to the depth of snow rendering difficult the operation of the tramway, no attempt has been made to ship since the first of January, and the ore broken down has been allowed to remain in the stopes.

Early in December the lessee started a portion of his force driving a drift to catch what has been known locally as the "hanging-wall" vein of the mine. This is a comparatively small vein which parallels the main vein, and from which some very rich ore was extracted under the first superintendence of Mr. Davys. He worked the vein some distance above the No. 4 level. At this point it presented a uniform width of 2½ feet, and the ore chute was 120 feet long. Mr. Davys stoped out 30 feet of this ore-body, and, mining a foot of waste with the ore, produced 1,150 tons of an average value of 60 ounces of silver and 7 % copper. An immense "cave-in" occurred in this portion of the mine workings, which affected all the ground between the No. 4 level and the surface, and further work was abandoned. Some distance below the former workings Mr. Davys ran his drift to pick up this vein. This was advanced through the caved ground for a distance of 130 feet, and in the solid formation, a

few feet beyond, connection was made with an old cross-cut, by means of which the vein was reached. At the point where he has now encountered it, the vein has a uniform width of 2½ feet, and the ore appears to be equally rich with that taken out some years before. Mr. Davys has ascertained that he has 41 feet of the vein available for stoping under his old workings, and the ore chute appears to be of the same length. In addition to this there is a vertical depth of 210 feet between the No. 4 and the No. 5 levels, within which no work whatever has been done upon this vein. With a crew of from 20 to 25 men the lessee expects to maintain an output of 500 tons per month.

The lessee intends also to give some consideration to the large bodies of low-grade ore which have been encountered in the different workings of the mine, and he has every confidence that by a system of concentration means will be found to render profitable the working of the $5 and $6 ore which heretofore has been left untouched in the stopes.

ATHABASCA-VENUS, LIMITED.

This is a newly organised company which has taken over the mining properties of the Athabasca and the Venus Mining Companies. It is a Canadian company, the head office of which is in Toronto, and the British Columbia office at Nelson. A. H. Gracey is the local manager.

The company did not commence operations until August last, and for the first 3 months the men were engaged in getting the *Venus* property in shape for mining, after an idle spell of about 2 years. Extensive development had been carried on at the *Venus*, there being an aggregate length of 3,000 feet of tunnelling, most of which is upon the vein, and when the property passed into the possession of the present company the estimated ore reserves approximated 8,000 tons. There have been four tunnels run in on the *Venus* vein, the most important of which is the No. 3. This was run as a cross-cut for 250 feet, and was continued along the vein for 500 feet, the face of the tunnel giving a depth of close upon 500 feet on the dip of the vein. The work done shows the *Venus* vein to vary in point of width from a few inches to 4 feet, and the clean ore in the vein has been sampled at $17 in gold per ton, but it is not suggested that the run of the mine will mill up to this figure.

Since commencing mining operations the manager has added a couple of thousand tons to the ore reserves, but in this has only kept even with the demand for ore from the mill, so that the ore reserves at present stand the same as when the property was taken over, although the property never looked so well as at present. The work done since operations were resumed consists in driving the No. 4 tunnel ahead for another 300 feet, and in running intermediate levels between the tunnels, there being 80 feet between the No. 1 and No. 2 tunnels; 166 feet between the No. 2 and No. 3; and 100 feet between the No. 3 and No. 4.

The *Venus* mine has been connected with the 10-stamp mill of the *Athabasca* by a Riblet tramway, 7,300 feet in length. The mine terminus of this has been located at what will eventually become the No. 5 level of the *Venus*. The tramway has a nominal capacity of 30 tons daily, but this can easily be doubled if necessary. At the mill, additional storage capacity has been provided for the ore, bringing it up to 400 tons. Milling was commenced on November 24th, but as a series of experiments were necessary the tonnage, up till December 31st, 1902, did not exceed 800 tons. A scarcity of water has also interfered with the operations, and it was found necessary to install a steam plant for motive power. This was completed two weeks ago, and the mill has since been running at its full capacity of 30 tons per day. To get this tonnage put through the ore is not milled very closely, and the cyanide plant on the *Athabasca* is also being utilised. The returns for the few weeks in 1902 are not yet available, but assurances are given by the management that they are fully up to expectations, and that the developments in the mine are most encouraging.

The company furnishes employment to 30 men at the *Venus* property, and to 7 men in the mill. No steps have as yet been taken for the development of the *Athabasca*, as the mine is flooded and the water supply available is not sufficient to permit of the starting of pumps.

Juno Group.

This property, which adjoins the *Athabasca-Venus group*, is being developed by the Juno Mines, Limited, under contract, a crew of 14 men being employed. A working shaft has been sunk on the vein, and is now down 125 feet. The vein in this has been shown to be 4 feet wide, carrying free-milling ore which is expected to yield $20 to the ton. A long cross-cut is also being run to get depth on the ledge. This is now in 700 feet, and will require to be driven a considerable distance before connection can be made with the bottom of the shaft. The *Juno* property is so situated that it could be worked to the greatest advantage through the *Venus* tunnels, and an arrangement will be sought to admit of this being done.

DUNCAN UNITED MINES, LIMITED.

This Company owns the *Poorman* and *Granite* mines, and throughout the year has pursued the policy of development begun in 1901. This called for the development of the *Poorman* vein at depth by the sinking of a 300-foot shaft from No. 4 level. During the year this shaft was put down 320 feet and the driving of the No. 5 and No. 6 levels was commenced. The No. 5 is 150 feet below the No. 4, and was advanced 340 feet. At a distance of 225 feet in from the shaft an upraise was started to connect with the No. 4, and this is practically all in ore. On the No. 6 level a distance of 200 feet had been traversed, when, owing to a scarcity of water for power purposes, work had to be suspended below the No. 4.

The scarcity of water proved a serious drawback, and eventually the management was forced to work the mine a single shift, and the mill the remaining 16 hours of the day, but even this arrangement gives the Company but half the efficiency of its compressor plant. Until the water scarcity is removed, work in the mine will be continued in driving ahead the adit level, and another between it and the surface. So far this work has been attended with very gratifying success, the vein at the No. 4 proving itself with great regularity for 900 feet, and with normal values throughout. The Company has still 1,400 feet of ground ahead, through which the vein has been traced.

Milling was begun in August, and up to the end of the year 5,716 tons had been put through, producing 1,317 ounces of bullion.

Material economies have been effected in the working of the property during the year, and the Company is in shape to handle at a profit ore which was heretofore considered too low grade. Throughout the year the Company has furnished employment to a crew of men varying from 25 to 75 in number.

McDonald Group.

An important strike was made on this property during the year, when the ledge was cut at a depth of 300 feet. The two claims in this group (*Gold Hill* and *Silver Crown*) are situated on the south-east fork of 49-creek and, owing to their inaccessibility, development was carried on with the greatest difficulty. Surface showings on the ground were promising, and the vein was uncovered for 300 feet and found to vary in size from 18 inches to 3 feet, the ore from it assaying from $15 upwards, in gold and silver, with a small percentage of copper. It was thought best to open the property up by a cross-cut tunnel and work upon this was commenced four years ago. When the tunnel had been advanced 600 feet a large dyke was encountered, which proved to be 25 feet wide, and when this was passed through the ledge was reached. At this point the ledge is 3 feet wide, two-thirds of it being solid quartz and the remainder decomposed rock. Assays made from the latter have a value of $57 in gold to the ton. Very high assays were had from

the quartz but nothing in the way of a sampling of the ledge was attempted. The strike was made late in the year. As it was impossible to get supplies to the property the difficulties under which the work was carried on may be appreciated, it being necessary to trundle all material out of the tunnel in a wheel-barrow. A trail to the property has been started by the Government, and when it is completed in the spring an ore car and steel will be taken in and work on the property resumed.

Royal Irish. Arrangements have been made for the working of this property, which is situated at the head of Sandy creek, on the north side of the divide between Sandy and 49-creeks. One opening has been made upon the vein which has a width of 9 feet and is well mineralised, carrying stromeyerite and grey copper. Good silver values, some gold, a small percentage of copper and lead, and some zinc are indicated by the assays made upon the ore. A small force has been put to work drifting on the lead, but sufficient has not been accomplished to permit of forming any definite opinion as to the value of the property. Samples of the ore tested by the oil concentration system have given excellent results and it is likely that this system will be utilised in the working of the property.

Molly Gibson. This property was operated under a contract system during the greater portion of the year, under an arrangement by which the contractor received a fixed price per ton for the ore mined, as well as a price per foot for the development carried on. There was also a stipulation regulating the grade of ore to be shipped. The contractor operated the property from January to November, employing a crew of about 25 men. During this period there were shipped from the mine some 2,000 tons of ore, the bulk of which was consigned to the Nelson smelter. The development work prosecuted during this time consisted in driving ahead the two lower tunnels, and in connecting the same by means of upraises.

In November the Company owning the property resumed possession of the mine, and the intention at the time was to work on a very extensive scale. The programme outlined called for the shipping of only sufficient ore to keep the waggon road open throughout the winter, and in the spring work was to have commenced on the assembling of a concentrator of 100 tons capacity. The developments in the mine were most encouraging, a fine chute of ore having been encountered in an unexpected quarter. A disastrous snow-slide on the night of December 25th brought the Company's operations for the year to a close. This swept off the bunk-house and several of the miners were killed. As soon as the season permits new buildings will be erected and operations at the mine resumed.

YMIR MINE.

The Company operating this property underwent reconstruction during the year, pound shares in the new company being issued with 17 shillings credited on them for surrendered shares in the old company, the arrangement being equivalent to an assessment of three shillings per share on the stock. The management of the property was in the hands of Mr. S. S. Fowler up to the end of 1902, when it was taken over by Mr. R. M. Atwater, and the office removed from Nelson to Ymir.

During the year a great deal of work was done in the No. 10 adit. This gives a depth of 1,000 feet on the vein. At the point where the ledge was cut on this level, and for such distance as the drift has been advanced along it, the grade of the ore is not sufficiently high to give it a commercial value, but in the opinion of Mr. Fowler the workings are still to the west of the ore chute, for the tapping of which the tunnel was started. Development has also been carried on at the No. 4 and No. 5 levels, and some very good ore has been exposed. In

the former the drift has been advanced 100 feet east of the shaft, and in the No. 5 for a distance of 225 feet, but in neither level has the eastern boundary of the ore chute, which in the No. 3 level was shown to have a length of 350 feet, been reached.

There was a considerable reduction in the output of the mine for the year 1902, the amount treated in the mill approximating 50,000 tons. The returns from the ore were slightly lower than those of the previous year, the extracted values of which were $6.69 in gold and $1.27 in silver and lead. Of the decrease in ore values for the last year the fall in the metal markets reduced the value per ton at least 12 cents.

The Company's cyanide plant was in operation for close upon ten months during the year, having been started in March, and for the last quarter of the year proved itself to be very efficient. About 70 per cent. of the ore treated in the mill finds its way to the cyanide plant as vanner tailings. These carry about 20 per cent. of the gross value of the ore, and of this there is an extraction of fully 80 per cent. in the cyaniding. During the last portion of the year the Company's statistics show an aggregate extraction of 95 per cent. of the gross value of the ore.

Since the beginning of the current year, R. M. Atwater, Junior, has assumed control of the Company's interests in this Province. He is of the opinion that there is a good likelihood of striking the ore chute in the No. 10 level. Where it has been opened up in this level, the ledge presents the same appearance as in the upper workings, where good values were obtained. The No. 10 tunnel was advanced 2,154 feet before the ledge was cut, and since this there have been 400 feet of drifting along it. This work is still being pushed ahead at the rate of 100 feet per month. So far as the ledge has been opened up in the lowest level it has shown a constant gold value, but considerably below the payable grade. In the upper workings of the mine there is good ore in the No. 5 level, which is the lowest opened, with the exception of the No. 10, and in the latter the work has not been sufficiently advanced to pick up the ore chute on the pitch which it is supposed to have. Of the developements in the No. 5 level, they are sufficiently important to justify the statement that the mine has a long life ahead of it.

There is every likelihood that the output of the mine for the current year will greatly exceed that of 1902. At the present time, with 60 stamps dropping, between four and five thousand tons are being treated in the mill, and the records for the first two months of the current year exceed those of any months in 1902. The ore now being treated has an extraction value of $8 to the ton, which is recovered either in the mill or the cyanide plant or remains in the concentrates. Against this there is the production cost of $4.43 per ton, which of course includes the cost of development. This cost it is expected will be materially reduced during the year as the result of the connection established between the upper and the lower workings of the mine. This obviates the necessity for pumping, an important saving, and by the first of April it is expected the output will be handled through the No. 10 level by a series of ore passes. These and other economies are expected to reduce the production cost per ton by at least 43 cents.

The Company furnishes employment for a crew of 120 men.

Wilcox Mine.

This property, which comprises four claims on Wild Horse creek, about 7 miles from the town of Ymir, has been under development for some time past by the Broken Hill Mining and Development Company, which is capitalised for $1,000,000. The development on the property consists of about 2,500 feet of tunnels and drifts. This work has given a depth of 200 feet on the vein on the *Fourth of July* claim, and the extension of the tunnel on the *Wilcox* claim will give an additional depth of 400 feet on the *Fourth of July*.

During the year the Company has erected a Joshua Hendy mill, with a capacity of 20 tons per day, and the mill has been connected with the mine by means of a tramway 2,200 feet in length. The mill was started on an experimental run on December 15th, and was in operation for 40 days, during which period the feed averaged 18 tons per day. As the run was altogether experimental the result does not give anything like a fair idea of the value of *Wilcox* ore, the return per ton being given at $8.

The ore reserves in the *Wilcox* are estimated by the management at from 25,000 to 30,000 tons, which it is expected will yield values of $15 per ton. There are, however, some very rich bunches of ore in different parts of the mine, a 20-ton shipment being made in February, 1902, which gave smelter returns of $70 per ton.

The management expects to mill up to the full capacity of the plant during the current year. The mine furnishes employment to a crew of 15 men.

Union Jack Group.

This property is being developed by the Active Gold Mining Company, of which D. A. Cameron is the resident manager. The Company has, throughout the year, pursued a vigourous policy of development on the seven claims which make up the *Union Jack Group*, situated on the south side of Porcupine creek, about six miles from the Nelson and Fort Sheppard Railway, and reached by the Porcupine creek waggon road.

The principal showings of the group occur on the *Union Jack* and *Queen* claims. Two veins are being developed here, and in tunnels and shafts the work done aggregates 900 feet. On the *Union Jack* the tunnel has been driven for 312 feet, giving a depth of 210 feet on the dip of the vein. The vein appears to be about 7 feet wide, the ore having an indicated gold value of $12 to the ton. On the *Queen* property two tunnels have been driven which aggregate 600 feet. This work has shown the ore chute in the vein to be at least 300 feet long, and the ledge has a uniform width of 8 feet. Samples taken from this ledge give the ore a value of $6 in gold and $15 in silver. This ore, the management estimates, will concentrate ten into one, and the programme of the Company calls for the erection of a 100-ton mill. This mill should be in operation by September 1st, by which date it is expected the mine will be in shape to maintain an output of 10 tons high-grade concentrates per day.

All the work in the mine up to date has been performed by hand labour, but within the next month it is expected to have Durkee electric drills installed. In this connection the Company has put in a 25-horse power plant on the *Magly* claim, 4,000 feet below the level of the *Queen* tunnel.

Fog Horn Group.

This property is under development by the Golden Monarch Mining and Milling Company. There are two leads on the property, and these are being opened up by means of a cross-cut. This work aggregates 500 feet. One of the veins has been cut, and driving for the second is in progress. Good ore values are claimed in the ledge that has been cut, and the management intend putting in a mill this spring in order to treat the ore.

Hunter V. and Double Standard.

These properties, situate about three miles due east of the Nelson and Fort Sheppard Railway, on the divide between Hidden and Porcupine creeks, were taken over by William Davis, of Nelson, in January, since which time considerable work has been done upon them, with most encouraging results. As mining properties they differ from any other discovered in the District, being described as immense deposits of lime in which high silver values are found. This deposit has been opened in two places on the *Double Standard* and in one place on the *Hunter V.* by means of shafts. One of these was sunk 45 feet and the other 35, cutting the

lime deposit, which at the points selected had a depth of 26 feet. From the openings made by him Mr. Davis made a 2-car shipment to the Nelson smelter, the returns being a value of $18 in silver to the ton. An analysis of the rock shipped to the smelter gave the percentage of lime ranging from 30 to 40 %, and of silica about 25 %. The character of the ore is such as to secure very favourable smelting rates, amounting to about $4 to the ton.

Late in the year a syndicate of Nelson men, which is known as the Standard Development Syndicate, was organised, and secured a bond upon the properties, the consideration being $50,000 in cash and a quarter interest in the syndicate stock. This syndicate commenced operations in December, and a crew of about 15 men was worked on the property until a short time ago, when the force was cut down until spring opens. During the few weeks the syndicate has had charge of the property 12 cars of ore have been stoped and shipped to the Nelson smelter, the returns from which averaged between $13 and $14 to the ton in silver. The syndicate entered into a contract for the raw-hiding of 5 tons per day during the continuance of the season, and the force left at the mine at present is only such as is deemed necessary to furnish the ore for this contract. The economical handling of the ore calls for the building of a tramway, which would require to be about 2½ miles in length to give connection with the Nelson and Fort Sheppard Railway. The raw-hiding of the ore shipped since the present syndicate took over the property has cost $3.75 per ton.

The syndicate will resume operations in the spring on an extensive scale, when an effort will be made to secure a waggon road to the mine, as well as a tramway.

The *Second Relief* mine, which is situated some 12 miles to the north of the town of Erie, was worked intermittently throughout the year until work was finally suspended by reason of the supply of water giving out. The mill which had been brought to the property started operations early in the spring, and some 2,800 tons were put through during the year, which, together with the concentrates shipped, gave a total value of over $26,000.

The *Arlington* mine was worked steadily throughout the year, and shipments were maintained at the rate of 200 tons per month. The use of the mill on the property was discontinued, and the ore was shipped in its crude shape, the values ranging close upon $30 per ton.

The *Keystone* mine is held under a lease by certain parties, and it is being worked in a small way, no shipments having been made.

The *Canadian King* mine is being worked in a small way under lease, and during the year a car of picked ore was shipped, the net returns from the smelter for the consignment of 23 tons being given at $517.

Fern.

This property, situated on Hall creek, was operated under lease for the greater part of the year, during which time the old dumps on the property were gone over and much of the material put through the mill. The returns on the mill runs throughout the year were slightly in excess of $10,000. About the close of the year a new lease was secured on the property by E. Rammelmeyer. Since taking over the property the lessee has expended $4,000 in putting the mill, flume, pipe line and tramway in repair, and expects to spend another $1,000 on them before they will be in shape for work. The lessee was forced to suspend operations recently, owing to the insufficient supply of water for the generating of power and the running of the mill. Mr. Rammelmeyer's lease and bond runs for three years, and within the life of it the lessee hopes to be able to prove the *Fern* vein beyond the faults which have heretofore militated against the successful operation of the property.

Spotted Horse Group.

This property is situated on Barrett creek, about 3¼ miles from Porto Rico siding on the Nelson and Fort Sheppard Railway. A bond has been given upon the group on the basis of $50,000, and there is every probability that a mill will be erected on the property during the approaching summer.

The *Spotted Horse* vein carries a good grade of gold ore, which can be milled to advantage. During the year 1902 the owners ran a 30-foot prospect tunnel, and from the ore taken out in this work a shipment of 17½ tons was made to the smelter, the gross returns upon which were $368.59.

Queen Group.

This property, which adjoins the *Yellowstone Group*, was operated throughout the year by the Holmes Syndicate, under a lease and bond. The holders of the lease also had an arrangement whereby they were permitted to use the mill and power plant of the Yellowstone Company. During the year 4,402 tons of *Queen* ore were milled, which produced a gold value approximating $19,000, and in addition 246 tons of crude ore and concentrates were shipped, the returns from which were close upon $7,500. The Holmes Syndicate then allowed its lease upon the property to lapse. A few weeks ago one of the owners of the property started a small crew of men at work, and he expects to be able to pay for the development performed from the proceeds of the ore taken out.

Armstrong Group.

This property is situate on Erie mountain, about two miles from the town of Erie, and during the early months of the year was under development by the Transvaal and Zambesi Mining Company. On the *Black Night* claim of the group a cross-cut tunnel was run for a length of 280 feet. This passed through 80 feet of vein matter, both walls being cut, but the ledge appeared to be very much broken up. The tunnel gave a depth of 90 feet on the vein, and a two-ton sample of material gave smelter returns of $22 in silver. The engineer in charge of the work estimated that it would require $10,000 to open the property up in a satisfactory manner. The Company has not yet acted upon this intimation, and work has been suspended for the time being.

OFFICE STATISTICS—NELSON MINING DIVISION.

Number of claims recorded (mineral)		430
" " (placer)		48
Certificates of work issued		1068
Bills of sale, agreements, options and notices recorded (mineral)		229
" " " " (placer)		23
Abandonments recorded		4
Free miners' certificates issued :—		
Ordinary	1159	
Special	7	
Company	24	
		1190
Certificates of improvements recorded		107

GOAT RIVER MINING DIVISION.

REPORT OF E. N. MURPHY, MINING RECORDER.

I have the honour to submit herewith the annual mining report and office statistics of the Goat River Mining Division, for the year ending 31st December, 1902.

The progress for the year has not been as marked as was anticipated; still, considerable work has been done, with gratifying results, while a few promising discoveries have been made, notably the specular-hematite iron deposits between Crawford and Gray creeks, and large bodies of hematite iron between Goat river and Arrow creek.

Iron.

It is stated that the iron in the vicinity of Gray creek is of a very high grade, assaying nearly 70 % metallic iron, with only a trace of phosphorus. On the *Bismarck* and *Gladstone*, located by McMillan and Robinson, the original discoverers of the iron in this section, there is an 8-foot vein of clean ore. Several open cuts and excavations were made on this vein and in all the openings solid ore of high grade was exposed. In addition to the above, about 24 claims were staked in this vicinity. Amongst these are the *Lucky Jimmie Group* consisting of 8 claims, staked by White and Devlin; and the *Beaconsfield Group* of 6 claims, staked by Procter, Johnson and Baker.

At Kitchener an important discovery of hematite was made by R. Laib and associates. Float had been found to the north of the well-known deposits on Iron Range mountain, but prospectors were unable to locate the body from which it came. Early in the season Laib and his partners began a systematic search, and after a month's work discovered a large body of ore, comparing favourably, both in quantity and quality, with that of the deposits to the south of it, on the same mountain. The vein was uncovered in about 20 places, the ore being from 8 to 18 feet wide, of clean hematite, assaying 58 % iron. Eight claims were staked on the showing, and the vein was exposed on each separate claim, proving it to be over two miles in length.

The syndicate owning the extensive deposits of iron at Kitchener did but very little work during the past season, only performing the necessary assessment work on a few claims, having Crown-granted 43 of the locations early in the spring.

Summit Creek.

Summit creek, which empties into the Kootenay river six miles south of Kootenay lake, was the scene of much activity, and received the most attention from prospectors during the summer.

Bayonne Group.

This group, the most important in the Summit creek camp, consists of the *Bayonne*, *Columbus* and *Oxford*, and is situated about 24 miles from the mouth of the creek. It was discovered in the fall of 1901 by G. Harrison and F. Risdon, since when it has been bonded several times and is now held under option by B. White, of Nelson. A tunnel, 400 feet in length, has been driven on the vein, which is from 1 to 20 feet wide. A winze has been sunk 45 feet and an upraise made 60 feet. A considerable amount of surface work has been done, exposing the vein in a number of places, and, wherever exposed, quartz has been found which shows free gold on being mortared and panned.

Montana Group.

This group, consisting of the *Montana* and *Sultana*, is situate on Twelve-Mile creek, a tributary of Summit creek, and is three-quarters of a mile distant from the *Bayonne*. The vein on this property is about 3 feet wide, of highly auriferous quartz, giving assays up to $450 to the ton. As yet sufficient work has not been done to test the permanency of the ore-body, but it is the intention of the owners, P Casey and F. Aikens, to systematically develop the property next season.

Byjoe and Skookum.

These claims are situate about a mile south of the *Bayonne* and have very promising showings. The quartz on this group is similar to that of the *Bayonne* and contains high values in gold. The vein is said to be 25 feet wide. In the immediate vicinity of the *Bayonne* there are a number of properties with similar surface showings, chief among which are the *Pay Roll*, *Bank Check* and the *Cashier*.

Oxide.

Across the divide on the north fork of Summit creek, and at the head of the south fork of Cultus creek, is situate the *Oxide* mineral claim, owned by G. Matthews. This is said to have one of the best surface showings in

this section. The vein is free-milling quartz, carrying good gold values, is 20 feet wide and is exposed on the surface for 500 feet. With the exception of a few small openings, nothing in the way of work has been done as it was only located in August last.

Lost Mine Group.

This group, consisting of the *Lost Mine*, *Copper Ridge* and *Copper Peak*, and situate at the head of Shaw creek, has an exceptional showing. The vein-matter is composed of calcite and quartz, with chalcopyrite, and can be plainly traced at different exposures over the length of the *Copper Peak* and the *Lost Mine*, and for several hundred feet on the *Copper Ridge*, a total length (measured on the horizontal) of 3,300 feet. The width of the lead at different surface exposures varies from 100 to 300 feet. The values at the surface average $5 in gold and 4 % copper. A tunnel on the lead has been driven 250 feet, all in ore. The property is very difficult of access, being on a very rugged mountain at an elevation of 6,000 feet, with a very poor trail leading to it. I am told by the owners that a company is being formed in the East to work the group.

In the White Grouse camp nothing more than the annual assessment has been done on any of the claims, and nearly 50 % of the locations were allowed to lapse. The lack of transportation has retarded the progress of this camp and discouraged the majority of the claim-owners.

OFFICE STATISTICS—GOAT RIVER MINING DIVISION.

Certificates of work issued	306
Number of mineral claims recorded	240
Free miners' certificates issued	150
Certificates of improvements recorded	43
Bills of sale, bonds, etc., recorded	55

ARROW LAKE MINING DIVISION.

REPORT OF WALTER SCOTT, MINING RECORDER.

I have the honour to submit my report on the Arrow Lake Mining Division for the year ending 31st December, 1902.

The *Meadow* mineral claim is situated on the headwaters of Mineral creek, and has been operated by the Davenport Gold Mines, Ltd., which has sunk a shaft for a distance of 30 feet, in shipping ore all the way. Samples of ore have given values in silver and lead of $60 per ton, and it is intended to ship next summer.

The *Millie Mack* mineral claim is on Cariboo creek. The owner, William Pyer, shipped a 5,159-lb. sample to the Trail smelter, which gave returns: gold, 2.17 ozs., silver, 31.3 ozs. per ton, and lead, 9.5 %. There is a large showing of ore on this property.

The *Chieftain Group* includes the *Duchess*, *Dundas*, *Mammoth No. 2* and *Silver Tip No. 2*, all of which, as well as the *Chieftain*, have been surveyed and certificates of improvements issued. On the *Chieftain* a 200-foot tunnel has been driven, tapping the vein. There is a large quantity of ore on the dump. The owners intend taking in machinery next summer, if the Government will assist in building a waggon road to the property.

The *Big Ledge* vein is situated on Pingston creek and is of a width of about 30 feet, well mineralized throughout. Assays have given values of $16 per ton. Sixteen claims have been located on the vein, and of these six were surveyed this season and applications are being made for certificates of improvements.

The owners of the *Empress*, *Anna S.*, *Goodenough*, *Well Done*, *Forest Chief* and *Monarch* built one mile of waggon road, and if the Government will assist they intend extending this for about seven miles. This will enable them to take in machinery to develop their properties.

Paladora Group. This group consists of the *Paladora*, *Meadow View No. 2*, *Reward* and *Cornwall*, situated near the headwaters of Fire Valley creek. A good deal of work has been done on the group, mainly in stripping. Four shafts have been sunk, varying from 20 to 30 feet in depth, in all of which good pay ore has been found. Several hundred pounds of ore have been treated, yielding values of from $15 to $30 in gold and several ounces in silver, per ton. At the western end of the property a pay streak has been discovered.

The *Ballarat* mineral claim is an eastern extension of the *Paladora Group*, and has been operated by Shields Bros. A tunnel has been driven for 30 feet, exposing a well-defined vein 4 feet in width, giving assay values of $30 in gold per ton.

Office Statistics—Arrow Lake Mining Division.

Number of mineral claims recorded	27
Certificates of work issued	86
Certificates of improvements recorded	4
Bills of sale, etc., recorded	15
Free miners' certificates issued	64
Special free miners' certificates issued	2

ROSSLAND DISTRICT.

TRAIL CREEK MINING DIVISION.

REPORT OF J. KIRKUP, GOLD COMMISSIONER.

SIR,—I have the honour to submit my report of mining operations in the Trail Creek Mining Division during the year 1902.

The year 1902 witnessed substantial advances in the mining industry of the Rossland District. The gain in tonnage and gross value of ore shipped was very marked, indicating consistent progress in connection with the operation of the important Rossland producing mines, the output for 1901 being 283,307 tons, valued at $4,621,299, while the output for the year 1902 was 329,534 tons, valued at $4,893,395.

This measure of progress was achieved in the face of various drawbacks, and is, therefore, gratifying to a greater extent than would otherwise be the case.

The *Le Roi* mine was the only property to ship ore every week in the year. The *Le Roi No. 2* had a record almost as good, but shipments were practically suspended for the last two months of the year. In the early fall the *War Eagle* and *Centre Star* mines resumed shipping to the Trail smelter, having secured treatment rates previously unparallelled in the Kootenays for the same class of ore—viz., $5 per ton on first-class ore and $4.50 for second-class ore. With these rates assured, the mines added approximately 100 men to their crews, and have since shipped about 200 tons of ore daily from each property. The suspension of the *Le Roi No. 2* properties was presumably part of a campaign to secure more economical treatment rates from the Northport smelter, to which the mine was under contract for its entire product up to the middle of 1903. Since the first of the present year the *Le Roi No. 2* has shipped almost weekly, though in comparatively small consignments. The *Giant, Cascade, Rossland-Bonanza, Kootenay, Velvet, Spitzee* and *White Bear* mines shipped intermittently during the year. The operations at the *Giant* and *Velvet* were of special interest, inasmuch as surprisingly good results were secured from the ore treated, and the operating expenses of both properties were paid out of ore receipts after shipments were started.

Two incidents of note occurred in connection with the concentration of Rossland ores. The *War Eagle* and *Centre Star* mines inaugurated milling experiments on a commercial scale at the Bullion Extraction Works, near Rossland, and announced that they had succeeded in solving the vexed question of concentrating their ores, with the result that the experiments then undertaken would culminate in the construction of a mill capable of handling a regular and considerable daily tonnage in the spring of 1903. Another incident along similar lines was the establishment here of an office of the Canadian Ore Extraction Company, owning the rights for the "Elmore Oil Process" of concentration. A small plant operated by electrical power was installed, and with this apparatus a series of tests have been made on local ores. One of the good results attained is referred to later.

Fortunately, there were no local labour or other troubles, save the inconvenience occasioned by the shortage of coal and coke supplies for the smelters, as the outcome of the Fernie disaster and the deadlock following between operators and miners in the coal district.

The year 1903 opens with the promise of brighter things than the Rossland camp has yet seen. As soon as weather permits, there is an assurance that at least two concentrating plants will be constructed. The *War Eagle* and *Centre Star* mines will erect their mill when weather conditions are propitious, and early summer is expected to see the new plant completed. The only details vouchsafed with respect to the system to be adopted is that it combines desirable features of several well-known milling processes, the combination being designed to meet the peculiar characteristics of Rossland ores.

The Le Roi No. 2 Company has acquired a section of land west of the *Josie* claim for a millsite, and has ordered two units of the Elmore process from England. The machinery is in process of manufacture at the English works of the Allis-Chalmers Company, and is expected to be on the ground about April 15th, 1903. This plant will handle 50 tons of ore in each 24 hours, and is to be largely augmented if desirable results are secured. Machinery and buildings will cost approximately $25,000.

The *Kootenay* mine, owned by the Rossland-Kootenay Company, has entered a new era of activity. A considerable force of miners is engaged in stoping, and the management announces that definite plans for handling the ores will be decided upon at an early date.

English capital has been secured to develop the *Spitzee* mine, and operations on a large scale will commence at the property about the 15th of April.

With the passing of the snow, the *Great Western* mine, owned by the Rossland-Kootenay Company and having, approximately, a mile of underground workings, will be unwatered and submitted to a thorough examination, with a view to the adoption of plans for its permanent operation.

The *White Bear* has been developed to the 900-foot level, and recent reports of ore discoveries seem to indicate that the property will attain the producing stage at an early date.

The *Victory-Triumph* will be submitted to an expert examination as soon as weather permits, and the Company, an English corporation, will resume development.

The management of the *Jumbo* mine has fixed May 1st, 1903, as the date for a resumption of operations at the property, which possesses large deposits of ore somewhat low in grade.

These are some of the factors which have had the effect of substantially encouraging residents of the Rossland District, and which give promise of activity in actual mining unparallelled in the history of the District.

Appended hereto is a statement showing the amount of ore shipped, the gross value therof, the average number of men employed, the development and additions to plant during the year, together with the office statistics.

The ore shipments were, approximately, as follows:

Le Roi	213,200 tons.
Josie and No. 1	52,038 "
Centre Star	35,850 "
War Eagle	21,455 "
Giant	2,844 "
Nickel Plate	2,281 "
Velvet	1,500 "
Cascade	271 "
Bonanza No. 3	76 "
Columbia-Kootenay	74 "
Total	329,589 tons.

DETAILED STATEMENT.

Le Roi Mining Company, Limited—Le Roi Mine.

Tons of ore shipped (dry)	213,200
Average number of men employed	378
Underground	293
Surface	85
Development:	
Shafts	252 feet.
Drives	3,685 "
Raises	844 "
Cross-cuts	1,171 "
Winzes	156 "

NOTE BY PROVINCIAL MINERALOGIST.—The following extract from the annual report for 1902 of the Le Roi Mining Company is taken from the "Engineering and Mining Journal":—

"The important part of the report is the review of operations by the general manager, Mr. John H. Mackenzie. He reviews previous estimates of ore on hand, and comes to the conclusion that the reserves at the close of the year amounted to 447,358 tons of an average value of $9.96. The second-class dump contains 84,000 tons of an average of $7.50 per ton, and there is an addition of 3,000 tons estimated at $12.50 per ton.

"The mine was operated only 263 days, over three months having been lost by the strike of the miners. The ore mined and shipped to the Northport Smelter was 155,765 dry tons, averaging 0.373 oz. gold, 0.709 oz. silver, and 1,526 per cent. copper. The gross value was $1,821,773, equal to $11.70 per ton. There were also shipped 14,333 tons of ore from the dump, having a gross value of $147,517, or $10.29 per ton.

"The cost of mining and smelting was reduced during the year, although a large amount paid for exploration work was charged in the accounts. Mr. Mackenzie believes that there is no doubt that the working costs can be cut very considerably from the present amount. The costs per ton for 1901 and 1902 are shown in the following table:—

	1901.	1902.
"Stoping and loading on railroad	$3.487	$3.100
Exploration	.423	.451
Depreciation:		
Mine equipment	.080	.138
Surface improvements	.050	.061
Mine machinery	.106	.125
Freight on ore to smelter	.510	.400
Smelter expense	4.465	4.205
Depreciation of smelter plant	.232	.119
Interest and discount on ore in yard and matte in transit	.229	.233
Freight on matte to refiners	.536	.404
Sacking and crushing matte	.044	.043
Eastern representation, assaying, etc	.028	.013
Refiners' tolls and deductions	.534	.579
Metal losses in smelting	...	.781
Total	$10.724	$10.652

"The total development work done during the year was 3,123 feet. The cost of shaft sinking per lineal foot was $106.99, of cross-cutting, $18.92, and of drifting, $16.95. The expenditures as reported by the manager include $487,010 for mining ore, and $106,887 for new construction, development and additions to mining machinery and plant.

"The Northport Smelter, owned by this company, is at Northport, Washington, 17 miles from the mine, with a railroad connection. The location is good, as the smelter has an abundant supply of water, and an unlimited quantity of limestone for flux is accessible. Coke can also be obtained at a reasonable rate. The plant has 6 large water-jacket copper matting furnaces, 3 calcining furnaces, with other necessary machinery. Its capacity is 1,500 tons of ore a day. The operation last year was interrupted, to some extent, by the strike increasing the costs. The working expenses were $1,194,568, and new machinery and improvements cost $122,281. The works shipped 6,779 tons of matte, having a net value of $2,532,303. The total ore smelted was 265,761 tons, of which 56,074 tons were brought from the Le Roi No. 2 and Rossland Great Western. This purchased ore brings no profit to the smelter."

Le Roi No. 2., Limited—Josie and No. 1. Mines.

Tons of ore shipped (dry)	52,038	
Average number of men employed	184	
Underground	160	
Surface	24	
Development:		
Shafts	154	feet.
Drives	1,554	"
Raises	219	"
Cross-cuts	631	"
Winzes	614	"

Centre Star Mining Company, Limited—Centre Star Mine.

Tons of ore shipped (dry)	35,850	
Average number of men employed	170	
Development:		
Shafts	362	feet.
Raises	153	"
Winzes	50	"
Drives, Cross-cuts, Tunnels.	5,111	"

War Eagle Consolidated Mining and Development Company, Limited—War Eagle Mine.

Tons of ore shipped (dry)	21,455	
Average number of men employed	148	
Development:		
Shafts	1,116	feet.
Raises	129	"
Winzes	4	"
Drifts, Cross-cuts, Tunnels.	4,183	"

Giant Mining Company, Limited—Giant Mine.

Tons of ore shipped (dry)	2,844
Average number of men employed	14
Underground	11
Surface	3

Development:	
Drives	145 feet.
Raises	30 "
Cross-cuts	20 "
Tunnels	420 "
Winzes	31 "

Rossland Great Western Mines, Limited—Nickel Plate Mine.

(January 1st, 1902, to August 16th, 1902.)

Tons of ore shipped (dry)	2,281
Average number of men employed	37
Underground	30
Surface	7
Development:	
Raises	66 feet.
Cross-cuts	141 "
Winzes	16 "

Velvet-Rossland Mine, Limited—Velvet Mine.

Tons of ore shipped (dry—approximate)	1,500
Average number of men employed	50
Underground	18
Surface	32
Development:	
Drives	1,000 feet.
Raises	320 "
Cross-cuts	520 "
Winzes	300 "

Additions to plant during the year consist of one 20 horse-power Sterling boiler and steam stamp concentrator.

Cascade Gold Mining Company, Limited—Cascade Mine.

Tons of ore shipped (dry)	271
Average number of men employed	12
Underground	8
Surface	4
Development:	
Shafts	70 feet.
Drives	100 "
Raises	30 "
Cross-cuts	90 "
Tunnels	438 "

Bonanza Gold Mines of Rossland, Limited, N. P. L.—Bonanza No. 3. Mine.

Tons of ore shipped (dry)	76
Average number of men employed	8
Underground	6
Surface	2

Development:

Raises	40 feet.
Winzes	15 "

Kootenay Mining Company, Limited—Columbia-Kootenay Mine.

Tons of ore shipped (dry)	75
Average number of men employed	13
Underground	10
Surface	3

Development:

Drives	250 feet.
Cross-cuts	189 "
Tunnels	534 "

Rossland-Kootenay Mining Co., Limited—Nickel Plate and Columbia Kootenay Mines.

(August 16th, 1902, to December 31st, 1902.)

Tons of shipped (dry)	none.
Average number of men employed	50
Underground	40
Surface	10

Development:

Drives	460 feet.
Raises	72 "
Cross-cuts	206 "
Tunnels	18 "
Winzes	114 "

During the past year a large amount of development work has been done on the *White Bear* mine, the total of which consists of a shaft 850 feet deep, together with 1,400 feet of drifts. A small shipment of six tons of ore was made for the purpose of a mill test. The average number of men employed is 17.

The property of the *Big Four Consolidated* mines is situated immediately to the south-west of the City of Rossland, and consists of a number of fractional mineral claims with a surface area of about 52 acres. During the past year some 70 feet of underground work have been done, 5 men being employed at different times.

The *Homestake* mine was worked during a portion of the year, 18 men being employed, the work done consisting of 55 feet of open cuts and surface work, 55 feet of upraises and drifts in ore, 57 feet of drift, 7 by 8½ feet, and 128 feet of cross-cuts.

On the *Rossland-Green Mountain* during the past year, in addition to a great deal of diamond drill work, 200 feet of sinking and 500 feet of cross-cutting was done. This claim is situated some two miles to the north-west of Rossland, and is one of the most promising properties in the District. An additional 60 h. p. boiler was added to the plant during the year, and an average of 18 men were employed.

The *Spitzee* mine was closed down the greater part of the year, but as soon as the snow goes off it is proposed, for the purpose of prospecting the property on a large scale, to construct new headworks at a more central point on the property, the boundaries of which have been materially enlarged by the addition to the group of the *Derby* and *Nelson No. 2* claims. A compressor plant will also be installed, the mechanical apparatus, as designed, being capable of hoisting from a depth of 500 feet.

OFFICE STATISTICS, TRAIL CREEK DIVISION.

Mineral claims recorded	81
Placer "	1
Certificates of work	205
Money paid in lieu of work	5
Certificates of improvement	39
Records of bills of sale, etc	49
Water grants	7
Free miners' certificates, personal, regular	651
" " " special	5
" " companies, regular	18
" " " special	1

BOUNDARY DISTRICT.

The Boundary District includes the Kettle River, Grand Forks and Osoyoos Mining Divisions. These Divisions are so closely connected as regards the operation of their mines and smelters that it is difficult to note separately the advancement in any one; descriptions of the various properties will, however, be found under their proper headings. The District has been the centre of general interest for the past few years. The ore shipped during 1902 was 521,401 tons, as compared with 396,210 tons during the previous year. Descriptions of the smelting plants in operation have been given in previous reports of this Department.

The following extracts are from a paper read before the Canadian Mining Institute by Dr. Albert R. Ledoux, of New York:—

"The ores of the Boundary Creek District are very low grade, but the ore bodies large, if irregular. Nature has compensated, to a great extent, for the grade of the copper ore by making it self-fluxing, so that probably nowhere on this continent can smelting be carried on more cheaply, given fair railroad rates and fuel at a reasonable cost.

"It is also nothing but simple justice to say that the Boundary is to-day a producing district because of the railroads; that it is doubtful if there is a mine within its borders that would pay except at very favourable freight rates and reasonable coke charges. It certainly required considerable courage and considerable faith to build the Columbia & Western Railroad, and no one making the trip from the Columbia river to Phœnix can fail to realise at what expense such excellent facilities were supplied to the various camps. But it is not enough for railroads to build into a district such as this; they must be prepared to handle its product at a minimum cost, and to bring in the timber, machinery, supplies and fuel at the very lowest rates that will pay, if the prosperity of the country is to be established and maintained.

"Geology.

"It is not my purpose to go into the complicated geology of the Boundary District. This has been studied with the usual painstaking accuracy of your geological survey, and I understand that the results are soon to be made public. From such personal observations as I made, it is plain that the district is one of great disturbance; that within very small areas almost every variety of later and earlier igneous rock can be found, with the faulting, crushing, folding and metamorphosis due to these. This is nowhere more apparent than at Phœnix.

"I may venture to generalise with the assertion that the ores of Phœnix camp are almost exclusively altered limestone. On the north side of the ravine which divides the town the limestone cap is in place, massive and unaltered save by the pressure which has crystallised it, the outcrops of ore being largely at contacts between intrusive eruptive rocks and the body of the limestone. This is notably true of the outcrop of the *Brooklyn* mine, where the uplifting of the limestone by the intrusive igneous rock is very marked, and along the vertical crushing zone there has been a second flow of pasty porphyry, forming in a most interesting manner a breccia containing sharp, angular pieces of unaltered limestone and of the older porphyry. I may say here that in using the term 'porphyry' I generalise, not having attempted to distinguish the varieties of eruptive rocks extending vertically or horizontally between the granites and limestones, or filling fissures in the granite itself. In the mines on the north side I am informed that the ore-bodies exist in irregular masses of great size in unaltered lime, largely

resembling caves which have been re-filled with the ore-bearing material. The average ore of the best developed mine, showing nearly 500,000 tons in sight, is said to contain 38 % of silica, 16 % of oxide of iron, 15 % of lime and about 4½ % of sulphur, copper, 1.80 %, besides gold and silver.

"In all these claims on the north side of the ravine mentioned the ore is frequently cut off unexpectedly by vertical dykes or horizontal floors of porphyry, in a way which would be the despair of those whose duty it is to develop the property, were it not for the great size of the bodies when found. On the south side of the gulch at Phœnix, I venture to affirm that the mountain was originally divided by a strong dyke of fine-grained felsite, which crops out boldly in the railroad cut where it crosses the *Victoria* claim, and is traceable for 4,000 feet to the south, crossing the *Aetna* and dissappearing in the *War Eagle*. This dyke has not been cross-fissured by any subsequent geologic action, so far as can be observed by its appearance on the surface and at depths attained at present, or by the result of exploration with the diamond drill, which has penetrated it for several hundred feet at various depths and directions from the westerly side.

"It seems to me probable that on both sides of this main dyke, which forms a sort of wall, and for a thousand feet or more to the east and to the west, the limestones originally overlying the granite, shattered by innumerable disturbances and cross-fissured by secondary intrusions, have been mineralised and entirely altered by the solutions following up the main igneous dyke and spreading until nowhere, as far as I could observe, was the limestone left unaltered, so that practically all of the original limestone which was not eroded has been mineralised to a greater or less extent. There is everywhere a notable quantity of calcite, a secondary deposit of the lime.

"To the east of the dyke which divided the Phœnix hill, the same general characteristics are noted which I have outlined above, being observed on the *Gold Drop* and *Snowshoe* claims, and on the *Monarch*, except that on the *Knob Hill*, *Ironsides* and other westerly claims there is a large, altered oxidized zone, in which the copper is carried by magnetic iron oxide, while on the easterly side the iron cap is not so extensive.

"THE ORE.

"The ore of the mines on the north side of the gulch at Phœnix is said to contain, on an average, 38 % of silica, 16 % of oxide of iron, 15 % of lime, and 4½ % of sulphur, there being little change between the surface and lower ores, so far as the chief constituents are concerned. This is about the composition of the ore from the south side, although many other conditions are distinctly different. The upper ores are largely oxidized and, as stated, consist of massive magnetic iron ore carrying copper sulphide and gold, this surface ore changing, at an average depth of perhaps 25 feet, to ore more nearly resembling that of the *Brooklyn*, the iron being largely combined with sulphur, or sesquioxide, rather than in the higher oxidized form. By mixing these surface ores with those from lower levels an ideal mixture is obtained, enabling the furnaces to produce directly a 45 to 50 per cent. copper matte, carrying practically all of the gold and silver which the ore contains.

"With adequate railroad freights and fair charges for coke, it is probable that there are reasonably in sight in the Phœnix camp to-day several million tons of ore, which, with copper at 12½ cents per pound, could be treated successfully. In Deadwood camp the ore deposits are also enormous, averaging over 130 feet wide, and so situated that surface working can be prosecuted by quarry, a single drill dislodging a train-load of ore in a day.

"On the north side of the Phœnix ravine the large amount of ore developed is estimated to run about 1.80 per cent. copper, $2.40 per ton in gold, and 25 cents per ton in silver. The

workable ores from the south side of the Phœnix ravine contain, on an average: Copper, 1.70 per cent.; gold, $1.60, and silver 33 cents per ton. The ore from the easterly side of the main dyke dividing the Phœnix camp, as represented by the *Snowshoe*, *Gold Drop*, etc., probably runs by the car-load, as shipped, about 1.60 per cent. of copper, $1.50 in gold and 30 cents in silver. The run of the mines in the Greenwood camp, as shown by the smelter returns, is probably 1.60 per cent. of copper, $1.80 in gold and 50 cents silver.

"It may, therefore, be taken as a safe estimate that the very large amount of ore available in the Boundary District will vary from 25 pounds to 35 pounds of copper per ton of 2,000 pounds, with from 25 cents to 40 cents of silver per ton and from $1.50 to $2.50 per ton in gold.

"COSTS.

"Next to the quantity and grade of ore, the all-important question is, how cheaply can the values from these Boundary ores be extracted and marketed?

"Taking the *Ironsides* and *Knob Hill* together for the years 1900 and 1901, the figures show that 74 per cent. was from below ground and 26 per cent. from surface ore, varying with the time of the year. In the summer time a great deal more ore was taken from surface workings than from beneath; in the winter time surface mining was largely interrupted. The cost of mining these large ore-bodies in the Boundary has varied from $1.66 per ton to $2.10 per ton, the first-mentioned figure being the more recent. It is a difficult problem, as I have already hinted, and the one uncertain element in the prosperity of this District, how to handle the very large ore bodies without the risk of caving and ruining the mine, on the one hand, or the necessary employment of excessive amount of timbering, or leaving in the mine large blocks of pay ore as a support. The management of the companies have been studying the problem and the Granby Company have commenced ore handling with steam shovels, and propose to still further decrease the cost of mining by stripping from the surface down to the present level of the railroad track, and by the introduction of the caving system for lower workings.

"SMELTING COSTS.

"It has been seen that cost of mining in the District, even with high wages to miners, is very low, the conditions being most favourable. I come now to the all-important statement of the smelting costs.

"The Boundary ore being self-fluxing, indeed rather basic in character, allows the admixture of a certain quantity of silicious ores from the Republic camp or other Districts of which the ores carry gold and silver, and the sulphur being low permits of smelting without preliminary roasting. With the advent of railways from the south the Boundary smelters can procure more dry silicious ores at profitable rates. It may also be stated at this point that the freedom of the ores from bismuth, arsenic and antimony renders it easy to obtain a ready market for the copper product.

"With a consumption of about 11 % of coke, and with freight charges as they exist to-day, the cost of smelting at the most favourable location in the Boundary District, after charging against the smelter the cost of marketing the product, must be considerably over $2 per ton. Adding the present cost of mining, the total outlay for mining and smelting must be less than $3.66 per ton.

"With the introduction of caving and steam shovels at mines, and the bessemerising at smelters, with further reductions in cost of freight and fuel, sure to come with or without the advent of competing railways, I unhesitatingly affirm that the copper ores of Boundary should be mined, smelted and their contents marketed to a profit with copper at 12 cents in New York, and as railway extensions make other ores available which can be purchased cheaply.

the profit should increase. But there must always be, as elsewhere, many shipping mines too small to justify their own individual smelters, and mutual co-operation and a broad business policy should allow them all to prosper."

KETTLE RIVER MINING DIVISION.*

REPORT OF WM. G. MCMYNN, GOLD COMMISSIONER.

I have the honour to submit my annual report of operations in the Kettle River Mining Division during the year 1902.

The chief evidences of progress this year are a large increase in the total output of ore, the placing on a producing basis of several mines not previously regular shippers, the installation of more powerful machinery, the starting of another smelter at Boundary Falls, the enlargement of the smelter at Greenwood, and a material reduction in the cost of mining and smelting.

The output of copper ore, the chief product of the Division, increased to the extent of about 30 per cent. more than the output of the year 1901, notwithstanding that the New York average price for electrolytic copper for the year 1901 was 16.117 cents, whilst for 1902 it was only 11.626 cents, and that labour and other troubles at the Crow's Nest Pass coal mines compelled a stoppage of ore production during about two months of the most favourable part of the year for mining operations.

The following table will show, approximately, the gross tonnage of ore shipped from the different mineral claims in this Division during the years 1900, 1901 and 1902, respectively:—

TONNAGE OF ORE SHIPPED.

	1900.	1901.	1902.	Total.
Old Ironsides Group, Greenwood Camp	64,531	231,762	307,000	603,293
Mother Lode, Deadwood Camp	5,564	99,548	136,657	241,769
Cariboo, Camp McKinney	15,238	16,862	15,616	47,716
Sunset, Deadwood Camp	.....	800	7,455	8,255
Jewel, Long Lake Camp	160	319	2,160	2,639
No. 7, Central Camp	.....	665	532	1,197
Carmi, Carmi Camp	.....	885	.....	885
King Solomon, Copper Camp	.....	850	.....	850
Morrison, Deadwood Camp	.....	220	.....	220
Providence, Providence Camp	.....	.....	74	74
Brooklyn, Greenwood Camp	150	.....	.....	150
Ruby, Smith's Camp	.....	85	.....	85

*This will be known as the Greenwood Mining Division on and after May 1st, 1903.

As the water-shed of Boundary creek, on the west, and Fourth of July creek and the North Fork of Kettle river, on the east, is a part of the boundary between the Kettle River and Grand Forks Mining Divisions, there are probably a number of mineral claims situated partly in each of these Divisions; for instance, the *Emma*, in Summit camp, which shipped 650 tons during 1900 and 8,500 tons during 1902.

GREENWOOD CAMP.

Brooklyn Group.

The *Brooklyn Group* includes the *Brooklyn*, *Stemwinder*, *Montezuma*, *Standard* and *Idaho* mineral claims, the property of the Dominion Copper Co., Ltd., of Toronto, Ontario. Development work approximating 3,500 feet has been done on the *Brooklyn*, which has a shaft 268 feet deep with two levels, one at

the depth of 150 feet and the other at the depth of 250 feet. It is stated on good authority that a chute of ore on this 250-foot level has been proved to be at least 1,000 feet in length and about 20 feet in width. On the *Stemwinder* a shaft has been sunk to a depth of 344 feet. The surface improvements include some good mine buildings and a steam power plant.

Old Ironsides Group.

The Granby Consolidated Mining, Smelting & Power Co., Ltd., is the owner of the *Old Ironsides*, *Knob Hill*, *Victoria*, *Fourth of July*, *Phœnix*, *Aetna*, *Grey Eagle*, *Banner*, *Tip Top*, and *Triangle Fraction*, which last year shipped about three-tenths of the total ore production of this District. Last year's footage of development work was 2,113 lineal feet, of which 514 were sinking and raising, and 1,599 cross-cutting and drifting. This brought the total footage, to the end of 1902, up to 16,359 lineal feet (or more than three miles of underground work), of which 3,013 are sinking and raising and 13,346 cross-cutting and drifting. Included in the year's development work are two tunnels, known as No. 2 and No. 3 respectively. The portal of No. 2 tunnel is at a point above the *Old Ironsides* shaft-house. This tunnel runs under the *Knob Hill* railway spur, and connects with the 100-foot level on the *Knob Hill* claim. Ore is taken from this level and dumped into an ore-bin of 2,000 tons capacity, which was built last year above the *Old Ironsides* railway spur. No. 3 tunnel, which starts from a point about 50 feet below the new ore-bin, will tap the 100-foot level of the *Old Ironsides* and, eventually, the 200-foot level of the *Knob Hill*. Other work done includes a great deal of surface stripping, which exposed the ore-body to a width of from 300 to 400 feet, as well as the enlargement of the old ore quarries and opening of new ones. The new machinery installed in 1902 consisted of a Farrel-Bacon Style B ore-crusher, with jaw opening 42 inches by 30 inches, having a stated capacity of 150 tons of rock per hour, crushing it to a size not larger than 7 to 8 inches; a 100-h.p. Type K. General Electric Company's induction motor, belted to crusher; a 3-wheel brake system head-works, with 48-inch sheaves for 1-inch rope, installed at the top of a 2,000 feet gravity tramway recently constructed for conveying ore from the main quarry to the crusher. At No. 2 (*Ironsides-Victoria*) shaft, a 12 by 16-inch double cylinder, section motion, winding engine, capable of hoisting 6,000 pounds at a speed of 400 feet per minute, was installed. Surface improvements made in 1902 include the erection of a compressor building, 121 feet by 60 feet; a machine and blacksmith shop, 118 feet by 40 feet; a crusher building, 55 by 22 feet; two new ore-bins, together of a capacity of 2,500 tons, and some 2,500 feet additional C.P.R. railway tracks in switches and sidings. When the smelter is running full capacity, so that 1,500 tons of ore may be shipped per diem, the number of men employed at these mines is about 425, but when running at half of its capacity, that is with only two furnaces, the working force is reduced to about 250 men. Other machinery ordered in 1902 and now delivered, includes two Rand tandem compound air compressors, electrically driven and connected with motors by a rope drive, having high pressure cylinders 16 by 36, and low pressure cylinders 28 by 36, the rated capacity of the engines being 6,000 feet of free air per minute, or sixty $3\frac{1}{4}$-inch machine drills, together with two 700-h.p. type C, Westinghouse induction motors to operate compressors; twenty $3\frac{1}{4}$-inch Rand machine drills, and the following machine tools to complete the equipment of an up-to-date machine shop:—One screw-cutting lathe, 15-inch swing with 8-ft. bed, complete with friction counter shaft, compound rest, two face plates, one 10-inch 4-jawed independent chuck, etc.; one 32-inch lathe with 18-ft. bed, complete; one 24-inch stroke shaper; one 36-inch upright drill press; one 600-lb. single frame steam hammer, cylinder 7 inches diameter by 20 inches stroke; one hand-power bending-roll to roll plate, 7-16 inch thick and 48 inches wide; one Merrill power-driven pipe threading and cutting-off machine, to cut off and thread pipe from $2\frac{1}{2}$ to 8 inches, inclusive; and one power-driven splitting shear to cut 7-16-inch plate any width.

DEADWOOD CAMP.

Mother Lode Group.

The *Mother Lode* is the central claim of a group owned by the British Columbia Copper Company, Limited, of New York. As the main ore-body, so far as yet ascertained, occurs about the center of the *Mother Lode*, practically all the development work done on the group has been done on this claim. The mine ranks second in importance in the District, taking into account footage of development work done and tonnage of ore shipped. During 1902 its output of some 136,657 tons of ore was more than one-fourth of that of the whole Boundary District. Its total tonnage since it commenced shipping, in the fall of 1900, up to the end of 1902, is also nearly one-fourth of the District's aggregate. Its footage of development work now totals 7,749 lineal feet—approximately one mile and a half of underground workings—of which some 1,200 feet represent the development work done in 1902. The most important work done was the driving of a long tunnel well into the hill on which the big out-crop of ore occurs, and making connection by means of large raises with several ore quarries above. This tunnel is double-tracked and most of the ore from the quarries is conveyed through it, in 3-ton ore cars, to the big Farrel-Bacon crusher near the mouth of the tunnel, which was also installed in 1902. As the crusher is below the level of the railway tracks, a Jeffrey elevator has been put in to raise the crushed ore from the crusher pit to the ore-bin above the track. The new plant put in last year consisted of a 24 by 36-inch, 14 B, Farrell crusher, fitted with manganese-steel jaw plates, steel swing jaw and pitman. Its capacity is 65 to 80 tons an hour, crushed to a size not exceeding 5 inches. It is driven by a 16 by 20-inch right-hand, plain slide valve engine, fitted with Meyers' adjustable cut-off, and with a fly-wheel 90-inch diameter and 18-inch face. The Jeffrey elevator has a chain of 10 by 9 by 12-inch buckets and is equal to raising 2,000 tons per diem. Additions include a building for the crusher and engine, the framing for the elevator plant and necessary ore-bin accommodation, also a gravity tram 300 feet in length, to convey ore from the upper quarries to a Gates No. 5 crusher. New machine drills were purchased and other additions made to the general equipment. The mine, under existing conditions, can send down to the smelter from 700 to 800 tons a day, and with the completion of additional facilities now in hand will be equal to a larger output whenever the company shall enlarge the treatment capacity of its smelter, Approximately, about $25,000 on new machinery and buildings and $10,000 on development work represent the company's expenditure at the mine during 1902, outside the cost of producing the 136,000 tons of ore constituting its output for the year. With ample power, equipment and buildings, transportation facilities already provided, and big reserves of ore easily accessible, the *Mother Lode* mine is in a position to produce on a much larger scale whenever required to do so.

Sunset Group.

The *Sunset Group* is owned by the Montreal and Boston Copper Company, Limited, of Montreal. The group comprises the *Sunset*, *Crown Silver*, *C. O. D.* and *Florence Fraction*. During the year 1902 a total of 1,574 lineal feet of work was done in underground development, making the aggregate footage 7,155 lineal feet. A "glory hole" was also opened up in ore and 7,455 tons of ore were shipped to the company's smelter at Boundary Falls. Much more could have been sent, provision having been made in ore-bin accommodation and railway trackage for a considerably larger tonnage, but the smelter was in regular receipt of nearly enough custom ore to keep it going, so the *Sunset* reserves were not drawn on to any great extent. New plant installed during the year included a double-drum, link-motion, Jenckes hoisting engine, with 14 by 20 cylinders, and a safety platform cage. The mine had previously been sufficiently equipped with other plant. In 1902 the underground workings at the 100-foot level and the 200 and 300-foot stations were provided with electric lights. A commodious bunk-house was completed, railway trackage increased and the mine generally put in shape for maintaining a good output of ore.

Morrison Mine.

The Morrison mine, owned by the Morrison Mines, Ltd., of Spokane, Washington, was inoperative during 1902. Some 3,000 lineal feet of work was previously done in underground development of this property, and this showed the occurrence in the mine of several important ore chutes, whilst other large ore-bodies were located at the 300-foot level by the diamond drill. There is a power plant at the mine, and about 5,000 tons of ore on the dump, but heretofore the rates offered by the smelters have not been considered favourable enough to induce the owners to ship more than trial shipments. It has lately been announced that a contract has been entered into with the Montreal & Boston Copper Company's smelter to take 100 tons of this ore a day, and that a spur from the Deadwood branch of the Columbia & Western Railway is to be constructed to the mine, after which shipping is to be regularly maintained.

Central Camp.

Central, Wellington, Greenwood and Summit camps are cut by the dividing line between the two Mining Divisions—Kettle River and Grand Forks. The only work of any importance done in Central camp during 1902 was that done at the No. 7 mine.

No. 7 Group.

The No. 7 Mining Company, Ltd., of New York, owns a group of claims including the *No. 7*, *MeGregor*, *Glasgow*, *Helen*, *Lady of the Lake*, *Rob Roy* and others, all adjoining. Practically all the development work done on the group is on the *No. 7*, which has a working shaft down 320 feet, with levels run at 60, 120, 200 and 300 feet, respectively. About 2,000 lineal feet of work in all have been done in underground development, of which 600 to 700 feet were done during 1902. Transportation difficulties prevented much ore being sent out, so that only about 530 tons were hauled to the railway siding between Greenwood and Boundary Falls for shipment to the B. C. Copper Company's smelter. This, added to the previous years' shipments, brought the total output up to about 1,190 tons. The ore is quartz mineralised with gold, silver, lead and zinc. The average width of the vein where opened at the 300-foot level is about 30 inches, but in places in the upper levels, where it has been followed for a much longer distance, it widens to as much as 7 feet. The mine is equipped with a steam power plant and has comfortable accommodation for its employees, but the last few months a caretaker has been the only man kept on the property. An earley resumption of work is looked for; meanwhile the manager, Mr. Frederic Keffer, M. E., also general manager of the B. C. Copper Company, is making exhaustive concentration tests, with a view to definitely determining the value of a concentration plant for the mine, which will be installed should it appear desirable to put it in. In this way the transportation difficulty will, to some extent, be overcome.

Long Lake Camp.

Jewel Mine.

In Long Lake camp the Jewel mine was the only property operating to any extent, and this too closed down before the end of the year after having shipped about 2,160 tons of ore to the Granby Company's smelter at Grand Forks, thereby bringing its aggregate output up to 2,639 tons. The *Jewel* is another of the gold quartz mines of the Boundary, a class that will yet command considerable attention, with reasonable probability of proving profitable enterprises. The *Jewel Group* is owned by the Jewel Gold Mines, Ltd., of London, England, and includes the *Jewel*, *Denero Grand* (part interest), *Gold Drop* and *Massachusetts*, and the *Imperial* and *Exposition* Fractions. During 1902, 449 lineal feet of development work were done, mostly drifting. There are two shafts on the property, known, respectively, as the Main shaft and Rowe's shaft. The former is about 340 feet in depth and the latter about 160 feet. From the Main shaft, levels have been run at 50, 120, 230 and 330 feet depth, respectively, and from Rowe's shaft at 100 and 150 feet. The total footage of development work is 3,693 lineal feet, of which 992 are sinking and raising

and 2,701 drifting and cross-cutting. Besides doing the development work and shipping the ore mentioned above, plant and surface improvements were added to during 1902. A shaft-house, to replace that over Rowe's shaft (destroyed by fire), and an ore-bin were erected, whilst an additional hoist and a 6 x 8 x 10 Knowles pump were purchased. The installation of a stamp-mill and cyanide plant at this mine has long been under consideration in London, but the policy of the management appears to be one of "making haste slowly." There is a considerable tonnage of ore blocked out in the mine, and tests made some time since of 160 tons of *Jewel* ore at the Silica Works, Rossland, resulted in the conclusion that in bulk the ore has a recoverable value of about $12.

The *Ethiopia* was the only other claim in Long Lake camp to have had attention in 1902 beyond the necessary assessment work, one car of ore being shipped to the smelter, for test purposes. It is understood that the results were encouraging, but that capital for the further development of the property is not yet available.

Copper Camp.

From this camp, in 1901, the *King Solomon*, owned by Mr. D. C. Corbin, of Spokane, shipped 850 tons of ore and was then shut down to await, it is understood, the extension of a railway spur to the camp and an advance in the price of copper. In 1902, on the *Copper Mine* claim, known locally as the *Big Copper*, owned by Messrs. G. B. McAulay, of Spokane, and John Moran, of Greenwood, work was done which exposed an ore-body 174 feet in length and 82 feet in width. An open cut, averaging 15 feet in width and 26 feet 6 inches in height, was run 93 feet in the ore, of which there is a considerable quantity on the dump for shipment whenever conditions may be favourable for its disposal. The *Copper Mine* appears to be in a a rich sulphide zone, whilst on the *King Solomon* an oxide zone is met with. This section of the division has attracted the notice of geologists and mineralogists by reason of the oxidized copper-bearing veins being much in evidence here. Copper Camp is only half-a-dozen miles from Greenwood and four from the nearest railway point, so that there should not be much difficulty in solving the transportation problem whenever the time shall be ripe for dealing with it.

Smith's Camp.

Practically nothing was done in this camp in 1902 outside of assessment work. The option on the *Ruby*, under bond in 1901 to certain parties at Detroit, Michigan, was dropped, not for any good reason chargeable against the property, which developed satisfactorily, some promising chutes of good grade having been met with in the prospect workings, but for the too common reason that those who had the enterprise in hand found themselves unable to finance it. Other properties in this camp are the *Republic Group*, with well-defined veins of quartz ore carrying values in gold and silver, and the *Golconda Group*, on which are ores mineralised with iron and copper and carrying values in the precious metals, while there are several quartz claims near Boundary Falls which appear to be valuable, but, being Crown-granted, they have remained unworked.

Providence and Skylark Camps.

The feature of the year in these camps, which are situate in close proximity to the town of Greenwood, was the renewed attention given to the small but high-grade veins occurring on a number of claims in these camps. The *Providence*, in 1893, shipped ore to the Puget Sound Reduction Works at a profit, after the deduction of about $30 per ton for packing, freight and treatment charges. Afterwards, having been Crown-granted, the claim remained unworked until the latter part of the year 1901, when Mr. Wm. Fowler secured first a lease of it, then, in 1902, bought it and shipped 172 tons of ore, ranging in value from $80 to $150 per ton,

which returned about $20,000 to the shippers. This claim appears to have a permanent vein at 100 feet in depth where the shaft shows the paystreak to be continuous, varying in width up to 20 inches and maintaining its values. A company has now been organised to work the mine, and it is estimated that the average output, under existing conditions, will be about 45 tons per month. The success met with on the *Providence* influenced other miners to work claims in the vicinity, so that now the *Providence*, *Elkhorn*, *Strathmore* and *Gold Bug*, north of the town, the *Abercraig*, *Lancashire Fraction*, *E Pluribus Unum*, *Gold Finch* and others to the east, and the *Helen* on the south, are all being developed. During the winter 35 to 40 men have been employed on these several claims, the development of which is being watched with much interest. From time to time the advisability of developing this class of vein has been suggested, but for years the larger copper veins have had practically all the attention of mining men interested in this Division.

Camp McKinney.

Cariboo Group.

This group consists of the *Cariboo*, *Amelia*, *Okanagan*, *Alice*, *Emma*, *Maple Leaf* and *Saw Tooth Fraction*, all adjoining claims, which are owned by the Cariboo-McKinney Mining and Milling Company, Limited, of Toronto. The following comparative statement will be of interest:—

	1900	1901	1902
Ore crushed	15,238 tons	16,862 tons	15,614 tons
Bullion produced	11,469 oz.	9,439 oz.	8,100 oz.
Concentrates produced	557 tons	428 tons	550 tons
Value of bullion and concentrates	$160,831.35	$137,024.79	$131,324.58

The report published in the press after the Company's last annual meeting quoted the managing director as having stated that, of the 15,614 tons of ore mined and milled in 1902, 11,414 tons were taken from the *Cariboo*, 4,100 tons from the *Okanagan*, and 100 tons from the *Saw Tooth Fraction*; that the average value of this ore was $9.96 per ton, of which $6.95 or 69.8 % was extracted as free gold by amalgamation, $1.74 or 17.4 % was obtained in the concentrates, and the remaining $1.27 or 12.8 % was lost in the tailings; and that while no unusual development work had been done during the year, yet ore reserves had been kept opened up well in advance of the stopes. The development work done consisted of 1,040 lineal feet of drifting and 190 feet of raising, in all 1,230 feet. The average number of men employed full time was 41, of whom 25 were underground and 16 on the surface. Dividend paying was resumed in 1902, after an interval necessitated by a great deal of development having had to be done the previous year to recover the faulted vein. The Company's accounts show the total bullion receipts to the end of 1902 to have been $1,105,861.58, and the total of dividends paid as $509,337.52.

Waterloo.

The Waterloo Consolidated Mining and Milling Company, Limited, of Spokane, Washington, appears to have settled down to the steady development of the *Waterloo Fraction* mineral claim. Late in the year the new management commenced an active policy of development and since then a larger hoisting engine than the one previously in use has been installed at the mine, the shaft has been deepened from the 160-foot level to the 260-foot level, and cross-cutting to cut the vein at the deeper level is in progress. Of the 100 feet of sinking and 150 feet of drifting reported as having comprised the year's development work, it is probable some part of this work must be credited to 1903. However, the fact remains that ore of good grade occurs in the drifts at the 150-foot level, and that the outlook for the property being worked at a profit to the shareholders is brighter now than at any previous time since the company was organised.

WEST FORK AND UPPER KETTLE RIVER.

Owing to the lack of adequate transportation facilities, little other than the necessary amount of assessment work has been done on the different mineral claims in the vicinity of the West Fork and Upper Kettle river country. A few of the best developed claims on the West Fork are the *Carmi*, *Butcher Boy*, *Rambler*, *Sally*, *Washington*, *Idaho*, *Bell* and *Bounty*, and on the Upper Kettle river the *Mogul*, *Silver Dollar*, *O. K.*, *Colorado*, *Montana* and *Fourth of July*, all of which, in the near future, will probably be shippers.

In addition to the Mining Recorder's office at Greenwood, where Mr. George Cunningham has lately been appointed Mining Recorder, there are three sub-recording offices and Deputy Mining Recorders, namely, Mr. Henry Nicholson at Camp McKinney, Mr. Ainsley Megraw at Beaverdell, and Mr. J. C. Tunstall at Vernon, and the following statistics include the returns from these offices:—

OFFICE STATISTICS FOR THE KETTLE RIVER MINING DIVISION.

No. of free miners' certificates issued	741
" " " " (special)	4
" locations, mineral	328
" certificates of work issued	809
" abandonments recorded	6
" conveyances recorded	235
" certificates of improvements recorded	60
" locations, placer	11
" leases, placer	2

GRAND FORKS MINING DIVISION.

REPORT OF S. R. ALMOND, GOLD COMMISSIONER.

I have the honour to submit my annual report for 1902 on the Grand Forks Mining Division.

GREENWOOD CAMP.

Snowshoe.

The *Snowshoe Group*, situated in Greenwood camp, comprises the *Snowshoe*, *Alma Fraction*, *Pheasant* and *Fairplay* claims, and is owned by the Snowshoe Gold and Copper Mines, Ltd., of London, England, the latter company having acquired the property from the B. C. (Rossland & Slocan) Syndicate in 1901. The development work to date is 6,440 lineal feet, 2,000 feet being sinking and raising and the remainder cross-cutting and drifting. The work, in the first instance, was carried on at the eastern part of the *Snowshoe*, showing the ore to dip easterly into the other claims of the group. Later operations, at the western end of the same claim, have opened up a large body of ore, which is now being mined by quarrying.

The following is a brief summary of the development work done on this property :—No. 1 level run westward 677 feet into the hill (in ore for 300 feet), and 730 feet of cross-cuts and drifts, made chiefly in ore. Raise of 150 feet made to surface, in ore most of the way, and winze sunk 100 feet, in ore for 40 feet. At bottom of winze 250 foot cross-cut in ore for 170 feet, the total work of this No. 2 level being 660 feet, together with a raise of 140 feet to No. 1 level. Large main working shaft sunk for 300 feet, connecting with Nos. 1 and 2 levels. Ground explored below No. 2 level with diamond drill. Quarries have been opened, drifts run under them, and chutes made at intervals, the ore being drawn through the latter and

trammed to bins above the Phœnix branch of the Columbia and Western Railway, which crosses the property. In addition to the plant mentioned in last year's report, a 150-h.p. electric hoist has been ordered. The property is under the superintendence of J. W. Astley, and some 44 men are employed. The total output from the property is some 20,000 tons, almost all of which was shipped in 1902.

On the *Gold Drop*, adjoining the *Snowshoe* on the west, no work has been done this year.

WELLINGTON CAMP.

Winnipeg.

The *Winnipeg* mine was in operation during part of the year and some 785 tons of ore were shipped, of a considerably higher grade than most of that produced in the Boundary District. The total development amounts to about 4,500 lineal feet underground. The mine is connected by a spur with the Phœnix branch of the Columbia and Western Railway. Since a fire last summer, which destroyed part of the machinery, operations have been suspended, but it is expected that work will shortly be resumed.

The *Golden Crown* mine, owned by the Golden Crown Mines, Ltd., of Brandon, Manitoba, was worked for only a few months of the year, shipping about 625 tons. A number of leads cross the property, but on only three of them has development been done. The main shaft is 322 feet in depth and several levels have been run, one being 900 feet in length. This mine is also connected with the railway.

SUMMIT CAMP.

B. C.

The B. C. Chartered Co. of Montreal own the *B. C.* and other claims, commonly known as the B.C. Mine. The property, which is under the management of F. S. Parrish, has been closed down during the greater part of 1902, but in September shipments were re-commenced and an output of some 14,450 tons made before the close of the year. The total underground development is some 6,000 feet. The plant comprises 4 boilers (total 225 h.p.); straight-line 4-drill Rand air compressor; half a Class G Ingersoll-Sergeant air compressor, rated at 10 drills; one large and two small hoisting engines; sinking pumps, electric light engine, dynamo, etc. The mine is connected by a spur with the railway.

On the *Emma*, a large outcrop of low-grade copper ore exists. The property has been leased by the Hall Mines Smelting Company which mined some 9,000 tons of ore during the year and forwarded it to the smelter at Nelson. Most of this ore was taken from a large cut made in the hillside above the railway, where there appears to be a considerable quantity available. It is expected that underground development will be begun shortly to determine the extent of the ore-body.

With the exception of development work on some of the more important properties, nothing has been done in the Grand Forks Mining Division beyond that described. Notwithstanding that the smelters have been badly handicapped by scarcity of water and fuel, I am given to understand that there will be an enlargement of plants in the near future. A full description of the Granby Smelter at Grand Forks will be found in the Report of 1901, p. 1068.

Coal.

Nothing further has been learned regarding the discoveries of coal on the north fork of Kettle river. A description of this coal field will be found in the Report for 1901, p. 1071, and it is stated that steps are now being taken to carry out some development.

OFFICE STATISTICS—GRAND FORKS MINING DIVISION.

Free miners' certificates	427	$2,070 25
Companies' "	3	300 00
Special "	6	90 00
Certificates of work	580	1,501 00
Records of location	177	442 50
Conveyances	137	360 20
Certificates of improvements	51	127 50
Permission to re-locate	1	12 50
Filings	70	17 50
Water rights	2	46 50
Miscellaneous		308 30
Fees for Crown grants passed through this office		1,275 00
		$6,560 25

OSOYOOS MINING DIVISION.

REPORT OF C. A. R. LAMBLY, GOLD COMMISSIONER.

I have the honour to submit herewith my annual report of the mining operations in the Osoyoos Mining Division for the year 1902.

OLALLA AND KEREMEOS CREEK CAMPS.

Bullion Group.

The principal work done on this group consists of a tunnel 600 feet in length, intended to open, at a depth of about 700 feet, the large ore-body which surface exploration has disclosed upon the property. During September two cross-cuts were started upon veins cut by the tunnel, and in each case promising ore-bodies were opened, the ore assaying up to $9 per ton in gold and copper. On October 1st. a second tunnel was started, and is now in 90 feet.

Flagstaff Group.

This group is owned by Jas. Riordan and W. J. Brewer, and consists of the *Flagstaff*, *Searchlight*, *Copper Kettle No. 1*, *Nevada* and *McDougall* claims. Surface work has exposed a large body of self-fluxing ore. An outcropping of magnetic iron, traversing the property in an easterly and westerly direction, is heavily copper-stained, and at different points shows copper pyrites. A strong quartz vein cuts through this iron cap, and can be traced for over 400 feet.

On the *Flagstaff* there occurs another large body of ore, having a north and south trend, and consisting of lime and feldspar carrying bornite. The work during the year consists of open surface cuts and shallow shafts, done with the intention of determining the best point from which to drive a tunnel. Assays from this group run from a few dollars up to $30 per ton.

The *Opulence Group* consists of the *Smelter Fraction*, *Swansea* and *Hardscrabble Fraction*. The principal ore-body occurs on the *Opulence*, where a vertical shaft sunk 45 feet discloses a large amount of native copper ore.

The *Elkhorn Group* consists of the *Elkhorn*, *Homestead*, *Hillside*, *Surprise*, *Iron King* and *Olalla* claims. The entire group has been surveyed and is now being Crown-granted. The ore is copper pyrites and occurs along a contact between quartzite and lime. Values run as high as $30 per ton.

The *Copper King Group* is situated about one mile west of Olalla and consists of two claims, owned by John Stevens and John Buchan. During the progress of assessment work a lead of considerable width, and assaying $6 to $7 per ton in gold, was discovered. There is also a large body of copper ore on the property.

The *Flower*, *Cream of the Camp*, *Silent Friend*, *Lizzie D.* and *Roadside* are owned by Messrs. Courtenay, Shatford and Mangott. The work done consists of open surface cuts, tunnels and shafts.

The *Golconda Group*, owned by McEachren Bros., lies between the *Copper King* and *Flower Group*. A tunnel 250 feet in length has been driven on this property, disclosing values running between 3 and 4 per cent. in copper.

On the *Black Diamond* a shaft has been sunk to a depth of 50 feet. The ore at the bottom of the shaft carries 2 to 3 per cent. of copper. Surface stripping has also shown up quartz veins of much promise on the *Golden Rule*, *Caledonia*, and *Mount Zion Groups*, but little work has been done, sufficient only to represent the claims, consisting in open surface cuts and stripping.

The *Rawhide Group* consists of the *Rawhide*, *Dunvegan*, *Beaver* and *Gold Reef* claims, owned by McLean and McKinnon. A considerable amount of surface work has been done on the different claims, exposing on the *Rawhide* a vein of 20 feet in width, and on the *Gold Reef* a vein of 10 feet. Assay values from these veins run from $6.85 to $10 in gold and copper.

The *Green Mountain*, *Black*, *Alfred*, *Connection*, *Hope*, *Central*, *Recruit*, *Waverley*, *Payne*, and *Minerva* claims constitute the *Green Mountain Group*, and are situate on the Nickel Plate waggon road about three miles from Fish lake. A large body of pyrrhotite, carrying copper pyrites and gold, extends through these claims, assaying $8 in all values. The work consists of an 82-foot tunnel on the *Black*, 125-foot tunnel on the *Green Mountain*, and open cuts on the *Connection*, *Hope* and *Recruit*.

The *Scotia Group*, comprises the *Scotia*, *Scotia No. 2*, *Le Roi*, *Le Roi Fraction* and *Weeden Farm* claims. An open cut of 20 feet was made on the *Scotia*, and the old tunnel continued 10 feet. Other open cuts have been run on the vein higher up the mountain, in all 45 feet.

The *Dividend Group* includes six claims, viz., the *Dividend*, *Dividend No. 1*, *No. 2*, *No. 3* and *Diana* claims. The work done consists of two shallow shafts, the first 7 x 9 x 10 feet deep, and the second 1 x 7 x 10 feet. The surface stripping comprises about 300 feet, and the ore-body has been exposed in 20 different places. Assays run from a few dollars up to $20 per ton in copper and gold.

The *Apex Group* embraces the *Apex*, *Night Hawk*, *Keystone Frac.*, *Alpha*, and *Australian* claims, situated at the head of the South Fork of Keremeos creek and 16-Mile creek, about 2½ miles south-east of the Nickel Plate mine. On the *Apex* a shaft has been sunk to a depth of 20 feet, in addition to which there are several small open cuts. The ore is composed of chalcopyrite and arsenical pyrites. Assays give an average of $36.40 in gold and copper.

A tunnel has been driven on the *Night Hawk* to a distance of 20 feet on the vein, which is 15 feet wide at the end of the tunnel.

The *Shamrock* and *Billy Goat* are situate on Riordan mountain, near the headwaters of Keremeos creek. The Nickel Plate waggon road passes within a few hundred feet of the property, making access easy. Work so far has been confined to the surface, to determine, if possible, the extent of the ore-body, which runs the full width of the *Billy Goat* and several hundred feet into the *Shamrock*, where it forms a contact with granite. Assays run from $4 to $25 in gold and copper. Two cuts have been made on the *Shamrock*, each 30 feet long by

8 feet wide. Work on the *Billy Goat* consists of a shaft, with an open cut of 47 feet. A second shaft has also been started, and is now down 8 feet.

KEREMEOS COPPER MINES, LTD.

The work done during 1902 includes sinking 50 feet further in the *Gibraltar* shaft, a new tunnel on the *Guineviere* and a 12-foot shaft, 10 and 8-foot shafts on the *Lady May*, and two shafts begun on the *Standard*. The new tunnel on the *Guineviere* is in 75 feet, and is well timbered for the first 50 feet. It was started in a decomposed and greatly oxidized ledge of altered diorite containing iron pyrites, in some places the iron being solid and very heavy. In the *Gibraltar* shaft the lead is about 6 feet wide, with 18 inches of mispickel running within a few inches of the foot-wall. The mispickel carries from 5 per cent. to 15 per cent. copper. The dip of the lead is 70°. At a depth of 20 feet the shaft passed through the magnetic iron capping, which outcrops at the surface, and came upon the ledge, running north-east and south-west. The Company employed six men during the summer months, under the superintendence of Mr. R. W. Northey.

Nickel Plate Mine.

Development on this mine has continued during the year with a force of 25 to 50 men and about a mile of underground work has been completed in all, and 350 feet in depth has been attained. During the year it was decided to build a plant for the reduction of ore, and the erection of a 40-stamp mill, with concentrators and cyanide plant, is now in progress. The works are situate at the junction of Twenty-Mile creek and the Similkameen river. The motive power for the mill will be taken from Twenty-Mile creek at a point about 3 miles distant from the mine. A tramway to carry the ore from the mine to the mill was begun during the latter part of last year and it is expected the completed plant will be in operation by the latter part of the present year (1903).

The *Boston* mineral claim was prospected during 1902, but the nature and quantity of ore encountered was not deemed sufficient to warrant continuing the work.

A number of cottages were erected at the *Nickel Plate* mine for the use of the married employees, it being the policy of the management to encourage the settlement of families at the mine.

CAMP FAIRVIEW.

Stemwinder.

The work done in this mine during the year consists of drifting on the third level for 300 feet and preparing the ground for stoping the ore. A raise was made from the third to the second level (100 feet) proving the ore at that depth to be of a higher grade than in the upper levels. About 12,000 tons of ore were run through the mill from the different levels, three-fourths of it being from the main ledge, the balance being from the north ledge. The values were found to be about $3.60 per ton, 40 % of which was saved on the plates. The company had 12 Frue vanners in the 26-stamp mill but the concentrates saved by them were not rich enough to pay the excessive freight and treatment charges, so they have been replaced by tables constructed by the superintendent, Mr. Charles Ostenburg, which work very satisfactorily and give a very high grade product running from $150 to $500 per ton. The character of the ore was found to be such that the galena streak can be extracted by these tables and shipped to the smelter at a cost not exceeding 10 % of the value, and the balance allowed to run into tanks for treatment by cyanide, by which an extraction averaging about 85 % has been effected.

During the early part of the year a small cyanide plant was erected and low-grade concentrates and tailings to the extent of 1,000 tons treated with very satisfactory results, over $5,000 being taken from this testing plant. It has been proved that a good extraction can be

obtained by coarse crushing (20-mesh) and it is expected that the mill, now increased to 46 stamps, will crush in the neighbourhood of 175 to 200 tons per day of 24 hours.

The values of the ore from the third level proved to be about $6 per ton on the average, nearly 50% of which cannot be saved in the stamp mill, and for the past six months a large force of men have been erecting a cyanide plant with a capacity of 200 tons per day. It is expected that this will be in operation about the middle of March, 1903. The tailings from the run during the year are stored and will be put through the cyanide plant during 1903. A flume and pipe line, over three miles in length, has been built from Reed creek and a fall of over 1,000 feet is obtained. A Pelton water-wheel is being installed, which, it is expected, will drive the mill for a considerable portion of the year, thus reducing the cost of fuel.

Having no further room for storage of tailings, the mill has been closed for several months past. Mining operations, however, have been carried on and at present fully 10,000 tons of ore are broken and stored in the stopes, in order to have a large supply for the mills when they start working.

On an average, 50 men have been employed during the year, over half of whom were on construction work on the mill, cyanide plant, pipe lines, etc.

On the *Morning Star*, which was worked extensively some years ago, operations have again been resumed, and I understand the present management intend to continue the old shaft to a depth of 500 feet.

OFFICE STATISTICS—OSOYOOS MINING DIVISION.

Free miners' certificates	257
Records of location	303
Certificates of work	399
Records of conveyances	92
Certificates of improvements	38
Records of water grants	3

VERNON DISTRICT.

VERNON MINING DIVISION.

REPORT OF L. NORRIS, GOLD COMMISSIONER.

I have the honour to report a decided revival in mining here during the past year.

Milligan Group.

This group, comprising the *Old Man*, *Alberta* and *Transmere* claims, owned by G. Milligan, Jas. McCorkell, A. A. Watson and A. McPhail, is situated on the east shore of Long lake, about 2½ miles south-east of Vernon. The ore-body, which is of considerable extent and appears to be a mixture of limestone and a quartz conglomerate, carrying values of from $1.80 to $3.20 per ton in free gold, is exposed on the lake shore for a height of 500 feet by 200 feet wide, while some 3,500 feet back from the water's edge, where a ravine intersects, it is exposed again for a height of 150 feet and a length of 500 feet. The surface is covered by some 20 feet in thickness of clay shale. If this ore-body proves to be as extensive as it would appear, and should the values be uniform, it will undoubtedly be of very great importance. I understand work on these claims will be commenced next month, under the management of A. A. McPhail.

ARMSTRONG CAMP.

The Armstrong camp is situated on Aberdeen mountain, about 17 miles from Vernon and about 9 miles from Armstrong, at an altitude of some 5,500 feet. The top of the mountain is granite, and tilted against it lie strata of schist and slate much broken by dykes. On the *Silver Queen*, owned by the Silver Star Mining Company, there occurs a contact quartz ledge, with east and west strike, carrying galena with iron and copper pyrites, and assaying $100 per ton in silver and gold. Two shafts, 65 and 45 feet respectively, have been sunk on this property. The *Mystery No. 1* and *Mystery No. 2* lie about 2 miles north of the *Silver Queen*, and are located on a dyke of light grey porphyry impregnated with galena and iron pyrites and carrying values of $26 in gold and silver. The work done comprises one shaft 65 feet deep. North of and adjoining the *Mystery No. 2*, and on the same ledge, are the *Prince of Wales* and *Black Prince*, owned by A. Clarke, H. McMullin and J. Fleming, and the *Maid of Erin*, owned by H. Keyes, J. Ethier and J. Hamill. The ledge is from 1½ to 4 feet wide and carries galena with iron and molybdenite, giving assay values of from $30 to $100 per ton. On the *Prince of Wales* there are one tunnel and several cross-cuts; on the *Black Prince*, one open cut and two short tunnels on the ledge; and on the *Maid of Erin*, three short tunnels, two on the ledge and one being driven to cut the vein at 75 feet depth. East of the *Mystery* lie the *Gold Mountain* and *Woodland Bell*, owned by W. Daniels. The ledge here is of quartz, having a width of 5 feet, and carrying values at 15 feet depth of $20 in gold, together with some copper.

McPhail Group.

The Cherry Creek Gold Mining Company has a bond on this group, which consists of the *Rossland* and *Evening Star* claims, and is owned by A. A. McPhail and Jas. McCorkell. Two parallel ledges of quartz, each 2 feet wide, carrying galena, iron pyrites, and, it is reported, tellurides, run across the three claims, giving assay values of $34 (average) on ledge No. 1 and $78 (average) on ledge No. 2.

On the *Evening Star* a tunnel has been run for 110 feet on the ledge, which is here 4 feet wide, giving a depth of 300 feet. On the *Rossland* the ledge has been stripped for 150 feet, and a tunnel has been run in to tap it at 175 feet depth; this is now in 45 feet and has about 55 feet to go. There are 12 men at work, under the management of F. Williamson, of Nelson.

Morgan Group.

The same Company just mentioned has a bond on the *Guysboro*, *Morgan*, *Dawn* and *Morning* claims, owned by F. Williamson and E. Costley. Three parallel ledges, averaging 18 inches wide, run across the four claims, carrying arsenical iron and gold (60 % free), and giving assay values of from $50 to $1,000 per ton. On the *Morgan* one shaft has been sunk 15 feet and 80 feet of stripping has been done. On the *Guysboro* a shaft of 10 feet has been sunk, and an open cut, 40 feet long by 18 feet deep, made. On the *Dawn* and *Morning* there are about 40 feet of an open cut 15 feet deep. Work under the same management will re-commence in the spring. Both these groups lie on the north side of Monashee mountain, near Porcupine creek, at an elevation of about 5,500 feet.

About 5½ miles south-west from Vernon lie the *Royal Standard* and *British Empire* claims, owned by V. Miller, J. Hignman and G. Muller. W. Gendar, representing San Francisco parties, has six men now at work sinking, and has taken a bond for $25,000 at 25 % down. There are here nine veins of quartz, carrying free-milling gold, running from 10 inches to 2 feet wide, and giving values of from $8 to $48 per ton in free gold. The shaft on the *British Empire* is down 68 feet at the bottom, and the ore gives assays of $116 in free gold. These claims are situated on a range of hills that jut out strongly into Okanagan lake, splitting the north end into two arms, on the eastern of which is the terminus of the Shuswap and Okanagan Railway. It is here that the *Rex*, *Three Tramps*, *Gambler*, *Sarah*, *Morning Glory* and other well-known claims are situated, and in this vicinity extraordinarily rich specimens of gold-bearing quartz have been found, as well as native copper and sulphate of copper. From these finds, the general conformation, the numerous mineral-bearing quartz ledges exposed, and the high values obtained, it is generally conceded that the whole range, some four miles in extent, is well mineralised and warrants systematic and thorough prospecting.

On Siwash creek, J. Hamilton has staked the *Gail*, *Dawson*, *Blue Bell* and *Phœnix*. The outcroppings show oxide of iron and copper, giving values of 6.5 per cent. of the latter. Work is going on and will be continued all the winter.

Work will also be continued all the winter on the *Peoich*, situated about 16 miles north-west of Vernon and owned by H. McMullin and A. Clark. A tunnel is being driven to tap the ledge, and is now in about 220 feet. There is also a shaft of 10 feet on the ledge. The ore is of white and black spar, carrying iron pyrites, and has a width of 4 feet. The values are in gold, with some galena and copper.

On most of the other claims in this District but little more than the necessary assessment work has been performed.

OFFICE STATISTICS—VERNON MINING DIVISION.

Mining records	34
Free miners' certificates	47
Transfers	10
Certificates of work issued	33
Certificates of improvements issued	3
Claims Crown-granted	3
Hydraulic leases issued	1

YALE DISTRICT.

FROM REPORT OF G. C. TUNSTALL, GOLD COMMISSIONER.

I have the honour to submit my report of mining operations in the Yale District during the year 1902.

In the Yale Division the Mount Baker and Yale Mining Company of Whatcom, Washington, is taking preliminary steps for the erection of a stamp mill to work the large body of quartz on the *British Queen Group*, Siwash creek, three miles above Yale. The vein intersects the three locations comprising the group; it is 100 feet wide, and composed chiefly of porphyry, feldspar, and quartz, carrying free gold. From repeated assays made, the average yield is calculated at $3 per ton, and this should give a good return after paying all expenses. It is hoped that the successful prosecution of this work will do much for the District.

In the Similkameen Division little is being done beyond the necessary assessment work, owing to the lack of transportation facilities.

In the Ashcroft Division work has been diligently prosecuted on the principal locations in the Highland valley, which show every indication of proving valuable properties.

The Mining Recorder's reports on these three Divisions, together with my report on the Kamloops Division, follow.

KAMLOOPS MINING DIVISION.

COAL HILL.

Iron Mask.

The Iron Mask mine, owned by the B. C. Exploring Syndicate, of London, England, has been actively worked during the year with a force of 25 men. The shaft has attained a depth of 520 feet, and some 3,500 feet of drifts and cross-cuts have been made. Development has been systematically pushed without cessation, under the management of Capt. Argall. Three 50 horse-power boilers have been necessary in consequence of the difficulty encountered by scale in the tubes, deposited by the water, which contains a quantity of lime and magnesia. This admits of one boiler being constantly prepared for substitution when required, and prevents the delays that would otherwise ensue. The large quantity of water which was suddenly tapped in one of the drifts, and apparently came from an accumulation at a higher elevation, is being gradually reduced.

One trial shipment of ore, consisting of 47 tons, was forwarded to the Granby smelter, from which a return of $27 to the ton was obtained, after paying freight and other charges. This is one of several shipments made within a couple of years, with the object of testing the value of the ore. Six car-loads of ore were forwarded to the same destination in 1901, yielding a larger percentage than the above. One thousand tons of good shipping ore are at present lying on the dump. The report read at the meeting of the shareholders in London was favourably received, and it was deemed advisable to prosecute further exploration work, for the purpose of making certain that no reduction existed in the extent and value of the ore-bodies, after which measures will be taken for the local treatment of the output. This, it is hoped, will lead to the construction of a smelter at Kamloops.

The *Evening Star*, adjoining the *Iron Mask*, is owned by Mr. J. H. Morrison, and is one of a group of mineral claims named the *Stars of Yale*, situated about five miles south-west of Kamloops. The cross-cuts and tunnels completed last summer proved that the two large ore-bodies of the *Iron Mask* run through these properties. Last autumn a shaft was sunk on the *Evening Star* to a depth of 30 feet, which disclosed a large body of high-grade ore.

Python Group.

Negotiations are pending for the purchase of the *Python Group*, on Coal hill, as well as the *Homestake Group*, Adams lake, both owned by Mr. Wentworth Wood. The *Python* was the first claim located in the Coal hill camp, some seven years ago, since which time many promising claims have been staked in the same vicinity, over an area some 8 miles long by 3 broad, seeming to indicate the existence of a mineral belt. Work has been steadily carried on on the *Python* for some years past and it is expected that the deal now pending will be consummated and operations begun on an extensive scale.

Coal.

As stated in previous reports, a seam of coal was worked on Coal hill some eleven or twelve years ago, and proved to be of superior quality, capable of producing a good coke, but of insufficient thickness to be profitable. Some development was carried on, without very satisfactory results, and was subsequently abandoned. I am glad, however, to state that a company (the Empire Development Co.) has now been formed to prospect for coal in this vicinity. The late Dr. Dawson, of the Geological Survey, drew attention to the probable existence of a coal area in this locality, small seams being found outcropping on both sides of the Thompson river at Tranquille creek, as well as on the hills to the north of Kamloops. The formation is a sandstone, and it is the intention of the Company referred to to prospect by means of a diamond drill. Sixteen hundred acres of land have been secured from the Dominion Government and applications for 640 more are pending, making in all 2,240 acres.

Should the results prove satisfactory, the importance of this work can scarcely be over-estimated.

Cherry Creek.

The *Copper King* was purchased last year by Mr. A. N. Gray, of Brantford, Ontario, and 5 men were put to work on the property. The lead, which was somewhat broken, has been located and will be exploited with the object of ascertaining its extent and providing the most economical means of working it. The ore here is exceptionally rich in gold and copper values.

Glen Iron Mines.

The Glen Iron Mines are under lease to the Hall Mines Smelter at Nelson. The product amounted during the past summer to 3,700 tons and was used for fluxing purposes.

Savona District.

Mr. A. J. Colquhoun sends me the following information regarding Savona District:—

El Progresso and Tenderfoot.

"The main tunnel on the *El Progresso* mineral claim has been advanced 22 feet, a very hard dyke being encountered and cutting off the vein for a short distance. The work is now being carried on by developing the *Tenderfoot* vein on this property. On the *Tenderfoot* about 125 feet of work have been done, chiefly by drifting on the ore-body. The ore averages about 5 per cent. copper with some gold, and the lead is 12 feet wide.

Cinnabar.

"On the properties owned by the Hardie Mountain Cinnabar Co., considerable work has been done during the past year. Five tunnels were driven, as follows:—No. 1 tunnel, 350 feet; No. 2 tunnel, 234 feet; No. 3 tunnel, 230 feet; No. 4 tunnel, 152 feet; B tunnel, 100 feet; total, 1,066 feet; and about

$1,500 were expended on houses, offices, etc. Low-grade ore has been encountered in each tunnel, while in the open cuts on the top of the hill ore said to average from 2 to 3 per cent. in quicksilver has been found. During the year, from 14 to 16 men have been employed. It is the intention of the company to prosecute development work and possibly to erect a reduction furnace during the ensuing year.

"The Copper Creek Cinnabar Mining Co. did nothing beyond the necessary assessment work on its property this year, as the directors are awaiting the results of certain tests of the ore.

"The *Toonkwa* cinnabar claim, south of Savona, has been further developed and shows up a fine body of ore which it is contemplated to exploit on a considerable scale during the coming year.

"As there is a good demand for quicksilver and the supply is limited, it is hoped that the development will be carried on steadily, and, should the expectations be fulfilled, the outlook for this vicinity seems promising.

Dredging.

Mr. Boyd, of London, England, the owner of the dredge which operated the summer before last on the North Thompson river, obtained two leases on Tranquille creek, which is situated nine miles west of Kamloops, at the head of Kamloops lake. Operations were commenced in June, under the superintendence of Mr. J. W. Toole, and were prosecuted until the scarcity of water suspended them. The results have been considered satisfactory, despite numerous delays for repairs, and should prove profitable next season, as the ground becomes much richer as progress is made up stream. Dredging has been restricted to a depth of 12 to 14 feet along a flat which extends for a considerable distance on both sides of the creek, in order to reach, as expeditiously as possible, ground which will yield larger returns. Holes have been sunk at intervals to a requisite depth to test the value of the gravel, which was ascertained to average 7 cents at the mouth of the creek to 50 cents per cubic yard in the last excavations made, a distance of about 300 yards.

The fuel is procured from driftwood on the shore of the lake, the consumption being six cords per day. The gold is scaly and easily saved, no loss being reported from any cause. The flat has been formed by the erosion of the banks higher up. It was not deemed sufficiently remunerative by the early miners to satisfy their requirements, and it has lain idle during the many years that the creek has been worked for its auriferous wealth, which yielded in the early sixties from $5 to $8 per diem to the men engaged. The gold obtained was coarse, and nuggets were found ranging from $50 to $100 in value. At a later period the Chinese took possession, and earned from $1.50 to $2 per day, by shovelling into sluice-boxes. At the present time but few remain, the returns being too small.

Tranquille creek is about 15 miles long, and rises in a rolling country of great natural beauty.

The yield of gold produced in the Kamloops Mining Division last year was $2,350.

NICOLA VALLEY.

Mr. G. Murray, Deputy Mining Recorder, sends me the following information regarding the claims in the neighbourhood of Nicola:—

There has not been the same amount of prospecting carried on in this vicinity as in previous years and fewer claims have, consequently, been recorded; assessments have, however, been performed and the holders of the various mineral locations are satisfied with the results. The chief requisite here, as elsewhere, is transportation facilities.

The *Portland Group*, Aspen Grove, has passed into the hands of Indiana capitalists. A shaft has been sunk for 115 feet and a drift run for 50 feet, both in ore. The work has been done substantially and with a view to permanency, and in the spring it is intended to carry on operations on a larger scale. The owners appear well satisfied with the prospects of this property.

On the *Copper Standard* a shaft 50 feet deep has been sunk and, as there is an elevated ridge on the property, a drift of 40 feet from the bottom of this shaft gains a total depth on the lead of 90 feet. The vein carries a considerable percentage of high-grade ore.

The *Big Sioux Group* has an excellent showing as the result of several assessments.

On Ten-Mile creek assessments only have been performed on the various locations, with the exception of the *Aberdeen*, on which development has been steadily carried on, disclosing a lead of high-grade ore.

OFFICE STATISTICS—KAMLOOPS MINING DIVISION.

Free miners' certificates	$2,242 50
General mining receipts	2,375 35
Mineral tax	141 77
Tax on Crown-granted claims	160 71
	$4,920 33
Number of claims recorded	90
" certificates of work issued	242
" bills of sale registered	70
" mining leases issued	5

ASHCROFT MINING DIVISION.

REPORT OF J. W. BURR, MINING RECORDER.

I have the honour to submit herewith my annual report on the Ashcroft Division of Yale District for the year ending 31st December, 1902.

Placer Mining.

On the Fraser river considerable placer mining has been engaged in, with very good results, by Chinese and Indians, using sluices and rockers. The Fraser River Gold Dredging Company has been operating with its large bucket elevator dredge near Van Winkle bar, above the mouth of the Thompson river, and has taken out a large quantity of gold for the season. Unfortunately, a serious accident was met with, by which the dredge was submerged for a few months towards the close of the year, causing a suspension of work for a while, but it has now been again raised and, under the new management and with improved machinery, the Company expects to reap a rich harvest in the present year (1903).

On the Thompson river the usual amount of placer mining has been carried on with rockers and sluices.

Mineral Claims.

Quartz mining, consisting principally of assessment work, has been done on the *Mersey Group* of claims, situated on Chris creek, near Savonas, as well as on the *Bonaparte Group*, at Cache creek.

In Highland valley is situated the *Transvaal Group* of claims, composed of the following, viz., *Transvaal*, *Pretoria*, *Chamberlain*, *Imperial*, *Ladysmith*, and *Mafeking*, on which over $2,000 have been spent in development work, showing good ledges of copper-gold quartz carrying high values.

The same Company which owns the above-mentioned group is also the owner of the *Highland Group*, composed of the following claims, viz., the *Highland*, *Standard*, *Glenora* and *Virginia*. Assays taken from the *Highland Group* from different parts of the ledges were as follows, for five samples, viz.:—No. 1, $61.89; No. 2, $9.55; No. 3, $43.32; No. 4, $52.33; No. 5, $65.76—the values being principally in copper. From 700 to 800 tons of fine ore are on the dumps ready for shipment to a smelter, as soon as a road can be built into the valley. At present everything has to be packed in over a trail.

In addition to the above there are a great many valuable locations made in Highland valley on which the assessment work has been performed; amongst them might be mentioned the *British Lion*, *United* and *American Eagle* claims, owned by Messrs. Campbell, Woods & Co.; the *Albatross*, *Buttercup*, *Ajax*, *Laplander* and *Wren*, owned by Messrs. Hoskings, Knight & Co.; the *Silver King*, owned by Decker, Lyne & Co.; the *Sadie*, owned by Wade, Lewis & Co.; the *Star*, *Tamarac* and *Shamrock*, by Leitch, Cargile & Co.; the *Transvaal Fraction*, by Gillis & Ward, and the *Sunset* and *Last Chance*, by T. G. Kirkpatrick & Co.

About six miles above Lytton, on the Fraser river, a Vancouver Syndicate has taken up a group of 17 claims, at a place where there is said to be a deposit of great value for mineral paint.

On Deadman's creek prospecting for coal has been going on, with the result that several seams have been discovered. The company owning these areas purposes boring during the coming season, and the prospects are considered to be good.

Placer mining in the Ashcroft Division for the year has produced gold to the value of about $29,000 as near as can be ascertained.

OFFICE STATISTICS—ASHCROFT MINING DIVISION.

Free miners' certificates issued	144	.....	$813 25
Mining receipts	65	.....	1,061 70
			$1,874 95
Certificates of work	37		
Mineral claims recorded	47		
Placer "	2		
Bills of sale	11		
Mining leases issued	9		

YALE MINING DIVISION.

REPORT OF WILLIAM DODD, MINING RECORDER.

I have the honour to submit herewith my annual mining report and office statistics for the Yale Mining Division for the year ending December 31st, 1902.

Placer Mining.

As indicated in my last annual report, the yield of placer gold, failing new discoveries in this Division, continues to gradually decrease. The number of placer miners, now exclusively Chinese, shows a corresponding diminution, consequent on the fewer claims worked and resultant decrease in output. The absence of exceptionally high water of late years, during the flood season on the Fraser, has, to some extent, militated against the Chinese placer companies and individual washers. The experience of many years has shown conclusively that the washing away of the old banks and bars and the formation of new auriferous ground has a natural result, viz.:—transient renewed activity and concomitant increase of gold. Only during exceptional floods is it to be expected

that the gold contained in the benches and gravel banks, left intact by the river as it ordinarily flows, will be to any extent sluiced and concentrated on the bars farther down the modern channel.

The amount of placer gold mined in this Division for the year 1902 is, approximately, $12,000. As usual, merchants resident in this District, who do business with and for the Chinese miners, are my informants, and, of course, only an estimate can be formed. A further sum of $2,500 may be added to cover amounts shipped to the Coast by the operators direct, or taken with them on their return to China.

PRINCIPAL CHINESE PLACER WORKINGS IN THE YALE MINING DIVISION.

Location.	Name of Company.	No. of Mines.	System.	Water Supply.
Ruby Creek	Kia Kee	6	Sluices, ditches & flumes	Unnamed creek
Cornish Bar	Yung Jung	5	"	Silver Creek
Cat's Landing	Quin Woo	5	"	Devil's Lake
Hope Station	.....	4	"	Unnamed creek
Hill's Bar	On Lee	5	"	Hill's Bar Creek
McRae's Bar	.....	1	"	
China Bar	Kia Kee	5	"	Various small creeks
Boston Bar	Ah Wong	4	"	
Chapman's Bar	Ah Sing	3	Tunnel	

In addition to the above workings, which are of a semi-permanent character, at least in so far as a season or so is concerned, there may be some 25 Chinese engaged in a desultory rocking on their own account, who move from bar to bar as the lowering of the river permits, and as the limited extent of the top or pay gravel becomes exhausted. In all there are not more than 65 Chinese engaged at the most favourable part of the season.

On Cascade creek, opposite Emery, on which coarse gold was mined in small quantities up to within a couple of years, no mining has been carried on. On this creek the Chinese who worked the bed of the stream did not consider it necessary to use either plates or blankets, but whether the gold found resulted from attrition of the country rock, through which the waters have cut a deep canyon, or, possibly, from the sluicing of gravel benches left by the river higher up the mountain side, I am unable to say.

At Trafalgar bar, Mr. Wardle, of Hope, was engaged in sinking two prospect shafts, with a view to reaching bedrock and ascertaining the existence of paystreaks below the top gravel.

At Chapman's bar, 14 miles east of the latter, a Chinese company has three miners employed in running a tunnel, now 60 feet long. This tunnel is some 90 feet above present high water. The ground mined seems to be comparatively new. The pay dirt obtained is shot down a natural chute and then rocked at the river edge. As might be expected, the gold obtained, while much water-worn, is considerably coarser than the particles saved from the gravels of the present channel. With regard to this point, it might be mentioned that the deposits of gravel along both sides of the Fraser canyon, in this District, and which are situated far above high water mark of the present river, might well repay further prospecting. Even in the early days it is doubtful if the miners thought it worth while to go up on the mountain side, and at that time only high-grade gravel was looked for. It is quite possible that, intense as was the activity in former years along the Fraser, there may still be ground at considerable elevations which, on examination, will be found worth while exploring to bedrock.

Mineral Claims.

No great activity characterised lode mining during the past year, and, on the whole, the majority of claim-holders were content to perform the assessment work only.

On the *King* and *King Extension*, Messrs. Wadleigh, Wardle, etc., have driven an additional 20 feet of tunnel. Farther up the river the *Eureka*, *Victoria* and *Van Bremer* claims, on Silver peak or Eureka mountain, constitute a group of which great things was expected, and on which large sums were expended, principally in preliminary works. These were, in fact, the first claims Crown-granted in the Province and a shipment of a very high-grade silver ore was made to San Francisco in the early seventies. The excellent trail to the cabin and workings (5,000 feet) is still in good condition. No work, or even prospecting for new ground, has been done for many years.

Within three or four miles of Hope a group of claims was located during the past summer by residents of the village, and shows in places a ledge of iron pyrites, mingled in spots with arsenical iron. I am credibly informed that good values in gold were obtained from assays made.

The Murphy Mine.

On this, the oldest lode mine on the Mainland, and which is within a short distance of Hope station, Mr. Wadleigh's Seattle Company will shortly resume operations. When work ceased, a year ago, it was believed that the 850-foot tunnel was within 40 feet of the ledge. The difficulty of ventilating the face of the workings caused temporary delay, but once work re-commences it is expected to cross-cut, at the distance stated, the gold-copper ledge which shows up so well on the surface. The several extensions of this claim have had the usual assessment work performed.

Work on the gold-copper claims at Keefers is still being advanced.

On the Siwash creek claims, to work which a company (the Mount Baker and Yale Mining Co.) has recently been floated at Whatcom, the assessment work was done.

The Pacific North-West Mining Corporation had for some time a force of eight men employed in continuing an open cut in the bed of Siwash creek.

In the silver-lead camp of Summit City, of which one-half is situated in this Division, Messrs. Shannon, Jordan, Silverthorne and Stevenson have recorded their annual assessments. Work in this camp has for the last two years been restricted to assessments only, owing to the litigation which involved some of the best ground. However, as it is believed that the matter has been adjusted, it is much to be hoped that development of this promising field will be resumed with vigour as soon as this year's working season opens.

The construction of a permanent pack-train bridge across the Coquihalla, in the vicinity of the present 15-mile ford, would facilitate the earlier annual opening up of this camp, a matter of importance when the altitude of the claims is considered.

OFFICE STATISTICS—YALE MINING DIVISION.

Free Miners' Certificates	$ 365 50
Mining receipts, general	770 15
	$1,135 65
Mineral and placer claims recorded	51
Certificates of work issued	21
Grants of water rights recorded	3
Conveyances and permits	9
Crown grants issued	*nil.*
Placer leases	2

SIMILKAMEEN MINING DIVISION.

In the Similkameen Mining Division little has been done beyond that described in last year's Report (*see* Report of Minister of Mines for 1901, pages 1087 and 1166), although prospecting is being carried on, with promising results. The great requisite of this Division is transportation facilities, in order to render productive mining possible.

With the exception of a few Chinese at work on Granite creek, very little placer mining was done during the year, the total output of the Division being $2,510 in gold and $190 in platinum.

It is reported that the holders of the leases formerly belonging to the Granite Creek Hydraulic Company will resume operations in the spring. This property was described in last year's Report (page 1176), and no additional information need be given.

The occurrences of coal in the Similkameen Division were fully described in the Provincial Mineralogist's Report of last year (pages 1175, 1177, 1184), and little work has since been done. Boring operations have been carried on at Princeton with the object of determining the nature and extent of the seams.

A certain amount of development work has been done on the various mineral claims, but it has been impossible to obtain details of the work. The Provincial Mineralogist visited most of the principal claims in this Division during 1901 (*see* Mines Report, pages 1166 to 1187).

OFFICE STATISTICS—SIMILKAMEEN MINING DIVISION.

Free miners' certificates	223	$ 1,354 00
Location records	285	
Certificates of work	499	
Conveyances	124	
Mining receipts, general		3,938 90
Placer mining records	1	
" leases	2	
		$5,292 90

LILLOOET DISTRICT.

CLINTON MINING DIVISION.

REPORT BY F. SOUES, GOLD COMMISSIONER.

I have the honour to submit herewith mining and office statistics and annual report for the Clinton Mining Division of Lillooet District for the year ending December 31st, 1902.

The total ascertained yield of placer gold for this Division during the year is $5,020, showing an apparent serious falling off, as compared with 1901, but I am aware that a very considerable amount of gold dust finds its way past the buyers in this Division, and is never accounted for. Mining in all its branches has been quieter than for many years past.

Placer Mining. This class of mining is represented by a hydraulic lease on Big Bar, the only one giving returns. Claims have been located on Scotty creek, but so far there are no returns from them. The other sources of gold dust are the itinerant Chinese and Indians, who work on the banks and bars of the Fraser river.

Mineral Claims. Several mineral claims have been recorded in the valley of the Bonaparte, and a limited amount of development work has been done on the deposit of chromic iron ore on Scotty creek, referred to in last year's report. Development work to any extent has been done on one claim only, the *Bonaparte*. The development consists of a tunnel and shaft, the latter to a depth of 160 feet. On the Natron lakes, north of Clinton, no work done this year. The statutory amount required was paid in cash in lieu thereof, and Crown grants have now been applied for.

Dredging has been at a standstill during the year.

Coal. Several applications for prospecting licences have been received, principally for the North Thompson river, but I am not aware that any actual work has been done, either there or on the upper creek.

OFFICE STATISTICS—CLINTON MINING DIVISION.

Mineral claims recorded	7
Placer claims recorded	24
" re-recorded	1
Certificates of work	14
Record of conveyances	5
Mining leases in force	1
Dredging leases in force	10
Water grants	1

Revenue Collected.

Free miners' certificates	$286 33
Mining receipts general	740 00

LILLOOET MINING DIVISION.

Report of C. Phair, Gold Commissioner.

I have the honour to report as to the progress of mining in Lillooet Mining Division during the year 1902.

Mineral Claims.

The Anderson Lake Mining and Milling Company's property at McGillivray creek was worked for five months, with a force of 10 men, under the management of Mr. H. G. Blackwell; 2,750 tons of ore were milled and the tunnel extended 200 feet on the ledge. The property is under bond to Mr. A. W. Hawks, of Snohomish, Washington, who has already paid $6,000 in cash.

The *Lorne Group*, *Woodchuck* and *Countless*, at Cadwallader creek, were worked during the season and the ore, which was crushed by arastras, averaged $14.33 to the ton. The *Lorne* and *Woodchuck Groups* are bonded to Count Sofiano, who examined the properties with Mr. E. J. Short, M. E., and who is now in England making arrangements for the purchase.

The foregoing were the only properties worked continuously, but the annual assessment work was recorded for 59 other claims.

Mr. A. Abbott, of San Francisco, has a bond on the Bend 'Or Mines and it is his intention, as soon as the season opens, to employ a large force and commence active development as well as to erect a cyanide plant.

Placer Mining.

The value of the placer gold sold at Lillooet was $17,874 (Mr. A. W. Smith purchased $10,800, and Mr. W. Cumming $7,074), a decrease of $2,126 from the previous year.

The Bridge River Development Company and the Pacific Development and Improvement Company, at the North Fork of Bridge river, have expended, under the general management of Mr. W. W. Brown, $25,000 during the year, erecting 5,000 feet of flume and building four miles of waggon road, besides advancing the pit a long distance. Mr. Brown is now arranging to put in combination hydraulic and mechanical elevators, together with large water lifts, to enable him to reach bedrock about 40 feet below the river. He estimates the plant will cost $30,000. The average number of men employed is 25.

The Lillooet Hydraulic Mining Company's lease, on the Fraser river, was continuously worked by 6 Chinese.

Mr. H. S. Southard, with 3 men, only worked his lease at the Fountain for part of the season, as his water supply fell short.

Seven claims were recorded on Portage creek, between Seton and Anderson lakes, and three on McGillivray creek, Anderson lake. These creeks had been abandoned for several years.

Cayoosh Creek.

Professor J. A. Udden, Special Assistant of the Iowa Geological Survey, and his wife have been granted leases on this creek, near the Great Falls, and it is their intention to lower the creek, by blasting out the falls, so that they can mine to bedrock. From 1885 to 1888, inclusive, a great deal of gold was taken out of this stream but the miners were unable to reach bedrock on that portion of it which these leases cover.

Dredging.

The Iowa Lillooet Gold Mining Company, Limited, has secured an option from Mr. Peter McKenzie on his dredging lease at Lillooet. This lease comprises three miles of the Fraser river, and it is proposed to build

at once a modern bucket dredge, to be operated by electrical power generated on Lake creek, and capable of handling every 24 hours about 2,500 cubic yards of the material. The Company was organised in 1902 and the secretary states that over $70,000 of its shares have been sold. The Company sent Professor Samuel Colvin, State Geologist of Iowa, to examine the lease. In his report he states:—"The gravels of the channel, bars and terraces at Lillooet all carry gold in sufficient amount to justify the installation of a dredge. The amount of material available is large enough to keep a dredge busy for 20 years. In reality, it cannot be exhausted by a single dredge in 100 years. It is difficult to see how the possibilities of success could be more favourable."

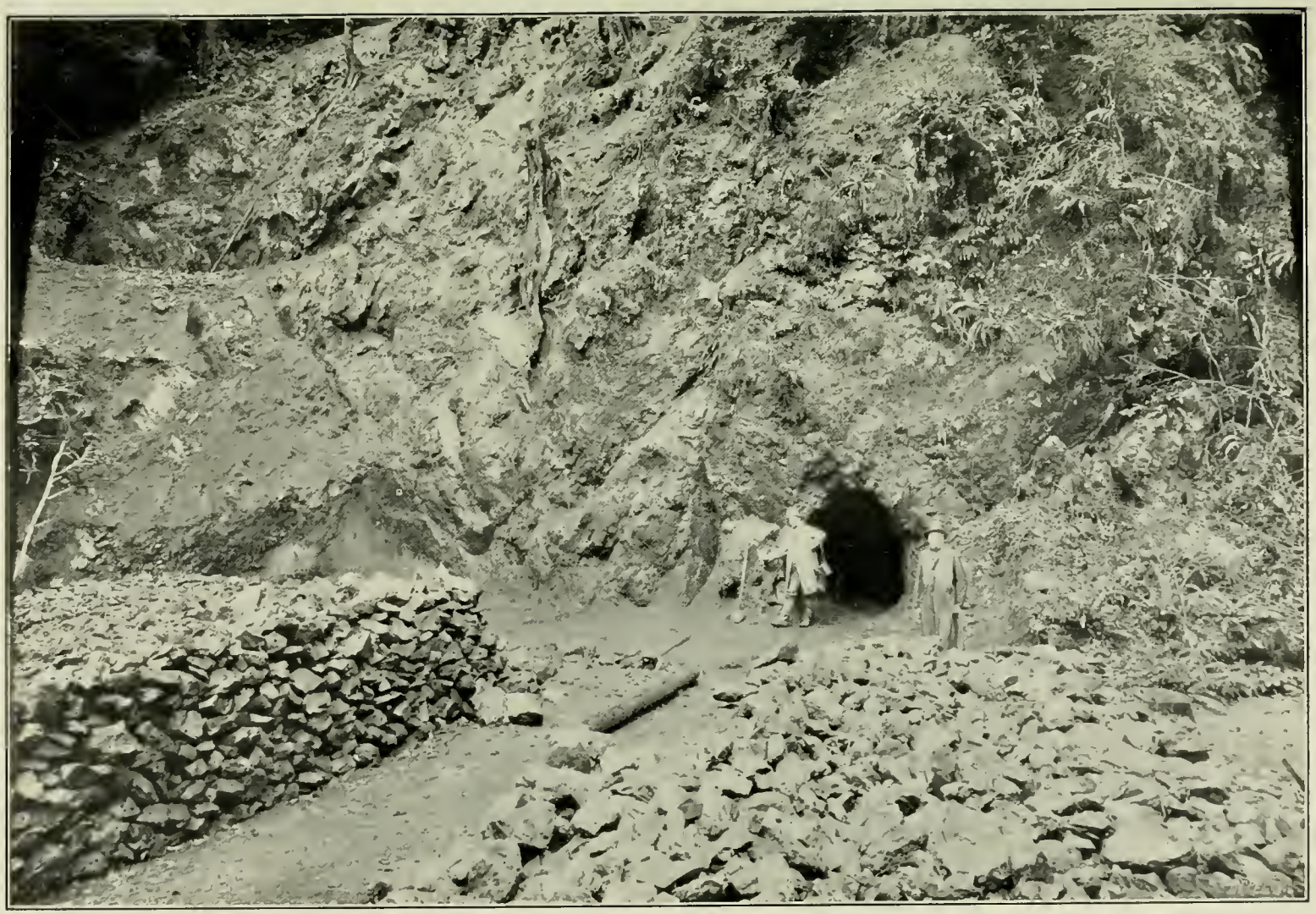
No work has been done on any of the dredging leases nor on many of the mining leases during the year. It is my intention, in a short time, to recommend for cancellation all that are delinquent.

OFFICE STATISTICS—LILLOOET MINING DIVISION.

Free miners' certificates issued	139
Mineral claims recorded	62
Placer claims recorded	15
Certificates of work	59
Conveyances recorded	58
Certificates of improvements recorded	4
Grants of water for mining	2
Mining leases issued	2
Mining leases in force	28
Dredging leases in force	6

Revenue.

Free miners' certificates	$1,028 75
Mining receipts, general	2,526 75
Mineral tax	1,104 69
	$4,660 19



EXPOSURE OF MAGNETITE ON BLUFF—SARITA IRON MINE BARKLEY SOUND.

VANCOUVER ISLAND AND COAST.

THE IRON ORES OF THE COAST OF BRITISH COLUMBIA.

The chief importance which attaches to the British Columbia iron deposits is that they are practically the only known occurrences of iron ore in quantity on the northern part, at least, of the Pacific Coast and, consequently, iron manufactured therefrom would have the whole of such territory as a market.

In regard to this it might be appropriate to quote from the Annual Report (1901) of the Geological Survey of the neighbouring State of Washington (page 256), in which State the general conditions in regard to fuel, fluxes, labour and geographical position are very similar to those of British Columbia, excepting that the B. C. coal is undoubtedly higher grade and possesses better coking qualities. The report says :—

"Washington has plenty of material suitable for fluxes and no fear need be felt in this particular. Labour is perhaps a little higher in Washington than it is in the East, but the difference would have little effect on the price (cost of production) of iron. The whole Pacific Coast would furnish the market, as very little pig iron, if any, is being produced in any of the States west of the Rockies, except Washington, at the present time (March, 1902), and the steel and iron being used on the coast is shipped from the East. The results shown here are rather against the probability of Washington ever becoming a very large producer of pig iron from ores occurring within her own borders, at least unless other deposits than those known at present are found. There is, however, one factor that has not been taken into consideration as yet, and that is the British ore occurring on Texada Island and perhaps some of the other islands of the Straits of Georgia."

There is, therefore, a large and growing market for the products of the iron ores of the Pacific Coast, a market in which the coast producer would have an advantage over the producer of the East to the extent of the lower rate of freight, which is, however, to a certain extent offset by higher Western labour cost, and the less advantageous smelting mixture of ores at present obtainable. As to the best location for an iron plant to treat these ores, the market of the Pacific slope is divided into that of the United States and of Canada, the former of which is much the greater, being protected by a tariff of $4 per ton on pig iron smelted in Canada.

This larger market at present offers an inducement for the establishment of a furnace south of the international boundary line, but it is handicapped by an import duty of 40 cents per ton on all iron ores imported (at least 75 per cent. of the total supply) and an inferior quality of local coke as fuel. On the other hand, if iron works were erected in British Columbia, they would have the advantage of better and cheaper fuel and the product would earn the bounty offered by the Canadian Government (chap. 6, 60-61 Victoria, and chap. 8, 62-63 Victoria), viz.,

(*60-61 Victoria, Chap. 6.*)

The Governor-General in Council may authorise the payment of the following bounties on steel ingots, puddled iron bars and pig iron made in Canada, that is to say :—

On steel ingots manufactured from ingredients of which not less than 50 per cent. of the weight thereof consists of pig iron made in Canada, a bounty of $3 per ton.

On puddled iron bars manufactured from pig iron made in Canada a bounty of $3 per ton.

On pig iron manufactured from ore a bounty of $3 per ton on the proportion produced from Canadian ore, and $2 per ton on the proportion produced from foreign ore.

2. The said bounties shall be applicable only to steel ingots, puddled iron bars and pig iron made in Canada prior to the 23rd day of April, 1902.

The Governor-General in Council may make regulations in relation to the said bounties in order to carry out the intention of this Act.

(62-63 Victoria, Chap. 8.)

The bounty on steel ingots, puddled iron bars and pig iron made in Canada, authorised by chapter 6, 1897, shall, on the termination of the period therein mentioned, notwithstanding anything in the said chapter, continue to be applicable until the 30th day of June, 1907, and shall be payable gradually reduced as follows:—

(*a.*) From 23rd of April, 1902, to 30th of June, 1903, both inclusive, the bounties shall be 90 % of the amounts fixed by said chapter:

(*b.*) From 1st July, 1903, to 30th June, 1904, inclusive, the bounties shall be 75 % of the amount, etc.:

(*c.*) From 1st of July, 1904, to 30th of June, 1905, inclusive, the bounties shall be 55 % of, etc.:

(*d.*) From 1st of July, 1905, to 30th of June, 1906, inclusive, the bounties shall 35 % of, etc.:

(*e.*) From 1st of July, 1906, to 30th June, 1907, inclusive, the bounties shall be 20 % of, etc.

2. Notwithstanding anything in said chapter 6, 1897, or in this Act, no bounty shall be paid under this Act on steel ingots made from puddled iron bars manufactured in Canada.

3. The Governor-General in Council may make regulations in relation to said bounties in order to carry out the intentions of this Act.

Fuel and Fluxes.

The only iron smelting as yet attempted on this Coast has been with the use of charcoal as the principal fuel, a little coke from Carbondale having been used, however. On this Coast there are no hardwoods and charcoal has to be made from spruce or fir, producing a fuel which is very much inferior in quality to hardwood charcoal. Under these conditions it is a question whether charcoal iron can be produced here to compete with the Eastern product; certainly the Irondale furnace never paid running expenses, according to the Report of the Geological Survey of Washington. Whenever, then, iron ore is smelted in British Columbia on an important scale, it will have to be with coke as a fuel.

The East Coast of Vancouver Island has, at Nanaimo and Comox, a plentiful supply of coal, much of which is suitable for coke-making. The collieries referred to mined during 1902 over 1,247,000 tons of coal, while there were manufactured at Comox some 20,000 tons of coke.

The coke at present made contains, it is true, from 15 to 16 % ash, which results largely from the ineffective separation of shale from the coal. There is no doubt, however, that the coal is capable of producing a coke which would run not to exceed 12 % ash, with very low phosphorus contents.

The limestone associated with the iron is exceptionally pure and free from injurious elements. Analyses made at the Government Laboratory show 99½ % calcium carbonate and ½ % carbon.

In the mining of iron ore the necessity of cheap transportation cannot be overrated, and in this respect, at least, the known deposits of iron on the Coast of British Columbia are singularly fortunate, inasmuch as nearly every one is within reach, by a short and cheaply constructed tramway, of the navigable waters of the inlets which indent the coast line.

On the waters between Vancouver Island and the Mainland, transportation could be carried on with barges, if so desired, and the coke and fluxes could be similarly conveyed, but for the ores of the West Coast of Vancouver Island, where the outside passage would be resorted to, more seaworthy, and probably self-propelling, boats, would be essential.

If an iron furnace was erected on the East Coast of Vancouver Island, the ores from the vicinity of the Alberni canal could be shipped across by a railway, which must eventually be built to the land-locked waters of the Straits of Georgia.

In attempting to give any description or idea of the iron ore deposits of the Coast of British Columbia, one is immediately confronted with the fact that, almost without exception, none of the known deposits have been worked other than superficially, and few have received any further development than very shallow open-cuts, tunnels or shafts, and, consequently, such facts as are known relative to these deposits are also superficial and far from conclusive.

Up to the present time there has been no market for such ores, except for a comparatively small tonnage which has been shipped to Irondale, Washington, for treatment there in a small charcoal blast furnace, and on a scale which must be regarded as purely experimental.

That such experiments have been satisfactory is a fact. They have demonstrated that a good merchantable pig iron can and has been produced from these ores, Texada island magnetite having been mixed with ore from Hamilton, Skagit County, Wash., in the proportion of 93 and 7 % respectively. The growing demand of the country west of the Rockies for iron in all its forms, and on which the freight charges from eastern points of manufacture or from England (at present the only sources of supply), form such a serious percentage of the ultimate cost, has led to a serious investigation of such known deposits of iron ore as occur in British Columbia, and has also stimulated an equally serious prospecting for new deposits.

The iron-master is seldom the mine-owner, and so far it has been the case of the former demanding a large and permanent supply of "*ore absolutely in sight*," before he would undertake the erection of a suitable plant capable of treating the ores of this coast.

Such a supply of "ore actually in sight" could not be expected without serious and expensive mining work on a large scale, and such work, without the actual presence or positive assurance of a blast furnace, might remain for many years unproductive, a possibility which the mine-owner could not or would not risk.

In other words, there has been an *impasse*. No iron plant without a positively assured ore supply, and no positively assured ore supply without an iron plant.

As the western market increased, the prospective profits of a large iron plant operated on the Coast became so great as to induce the iron-master, within the last two years, to supply much of the capital necessary for mining development work, either directly or by taking bonds on various iron prospects and performing a certain amount of development thereon; but even this work, while it certainly has developed a considerable amount of ore, has been as yet only superficial, and leaves still to be theoretically figured out both the ultimate extent of the deposits and the exact nature of their depositions.

It is not possible to give a detailed geological description of the region under consideration, inasmuch as no detailed geological investigation has been made of more than certain small isolated portions.

In 1885 the late Dr. G. M. Dawson made a rough and preliminary examination of the main geological features of Vancouver Island, intending to complete the work the following year, which he was unfortunately unable to do.

The result of his investigations, as far as they went, are contained in the report of the Geological Survey of Canada for 1886. This is to-day the authoritative statement of the geology of the Island, and from it copious quotations have been made in the following pages.

The oldest rocks of which there is any evidence on Vancouver Island are those named by Dawson "The Vancouver Series," and referred by him to Triassic age. These include "not only the entire mass of volcanic materials which unconformably underlie the Cretaceous, but also the interbedded limestones and flaggy argillites and quartzite." This intercalated zone is of considerable thickness, having been estimated at 2,500 feet at one place on the north end of the Island.

"These beds are frequently found resting upon granitic rocks. They have not, however, been deposited upon a granitic floor as the granites are evidently later in date than the rocks of the Vancouver series, and nothing whatever is known of the character of the surface upon which the volcanic and other associated beds were originally formed.

"These granites appear everywhere to be the material upon which these rocks (Vancouver series) rest.

"The only explanation which appears satisfactorily to account for the appearances met with is that, in consequence of upheaval and denudation, we now have at the surface a plane which was at one time so deeply buried in the earth's crust that the rocks beneath it became subject to granitic fusion or alteration.

"The present surface must have been, therefore, either covered to a very great depth by beds accumulated in regularly superposed layers, or the strata must have been heaped together by folding to such a depth that the lower parts of the whole were affected by such granitic fusion, which was gradually progressing upwards through the mass, incorporating the rocks of the Vancouver series as it went. It is clear that the granitic rocks beneath were in a plastic condition, not alone from the fact that they were found to penetrate the older series, but also from the evidence everywhere met with of the scattering out of fragments of the stratified rocks into the granites.

"The granites are almost always hornblendic and generally gray in colour. They, however, in many places have so little quartz and so large a proportion of hornblende that they become quite dark in colour and resemble diorites."

Following the deposition of the beds of the Vancouver series came a period of flexure and disturbance which must have affected principally a line nearly coincident with the Coast range of the adjacent Mainland and during which the granitic rocks of that range and its vicinity were either produced locally or forced up into their present relations with the stratified series.

A prolonged period, resulting in very extensive denudation, must next have supervened, with a movement in the sense of a depression progressing during the entire Cretaceous period.

Subsequent to the Cretaceous period a second era of folding and mountain-making occurred, which probably resulted in the re-elevation of the Coast Range, but acted even more violently along a line running through the western portions of Queen Charlotte and Vancouver Islands, a fact rendered evident by the crumpling and contortion of the Cretaceous strata in the vicinity of this line, while the same beds are relatively undisturbed both along the eastern shore of the Queen Charlotte islands and the north-eastern coast of Vancouver Island.

For the Tertiary period the region here specially described gives no information, except such as is afforded by the denudation and planing down of the older deposits.

It would appear, therefore, as we find it in the present age, that the great central mountain uplift or backbone of Vancouver Island is Triassic granite, which presumably underlies the greater part of the Island, either exposed or covered to a variable depth by the rocks of the uplifted and altered Vancouver series, and that this forms the greater area of Vancouver Island, while on the flank of the latter, on certain portions of the east coast, but rarely on the west coast, lie unconformably areas of Cretaceous rocks, including the coal-bearing series.

The Vancouver series, as has been seen, was originally composed chiefly of volcanic rocks interbedded with argillites and limestones.

These rocks have been metamorphosed, while still at a great depth in the earth's crust, by the molten granite, and since their subsequent denudation and upheaval have been subject to such great alterations that their original character is often obscured.

Vancouver Island forms the axis of elevation, and the lines of contact, of faulting, flexure, etc., conform roughly to its general coast line.

The immediate western coast line of the Island may be said to be chiefly composed of the rocks of this Vancouver series; the granites seldom occurring, but being in evidence on the mountains and immediately inland.

It would also appear that subsequent to the great granitic upheaval, with its accompanying granitic and felsitic dykes or spurs, which have penetrated the Vancouver series to so marked an extent, there has been a second and further volcanic action, with the injection of a second set of dykes, which are found to cut the first series, while in certain places it is probable that a third series exists, though it is possible that this last is of the same age as the second series.

These dykes are probably later than the Cretaceous rocks, and in many cases may be proven to have had considerable influence upon the general mineral depositions found on the Coast of British Columbia.

The only ore of iron that has been discovered on the coast, and proven by actual development to be of commercial importance, is magnetite, which has been found at a number of places to be described later.

Vancouver Island and the shores of most of the islands of the Straits of Georgia have been subjected to such great denudation, and in many cases also to glacial action, as to leave only a small proportionate area which might be even expected to contain either hematite or limonite. These areas would conform closely with those of the Cretaceous rocks which lie chiefly on the eastern side of Vancouver Island, and in which are included the coal-bearing strata. Cretaceous rocks also occur in outlying patches of varying size at the north and south ends of Vancouver Island, with other occasional small patches at isolated spots on the West Coast.

While magnetite can be smelted alone, it is certainly economically desirable to have some of the other ores of iron to mix therewith, hence the importance which would attach to the discovery of workable deposits of hematite or limonite on or near Vancouver Island.

Hematite.

Hematite ($Fe_2 O_3$) has been reported as found at several localities, but careful inquiry has failed to show any instance where such discovery has received any development, and where the mineral has been found in commercial quantity.

Both hematite and limonite are most likely to be found in beds lying covered with soil and vegetation, for which reason, in such a densely wooded district as is the coast of British Columbia, such deposits, if they exist, would be likely to remain for some time undiscovered, except by accident, or where beds had been cut into by some stream.

A body of hematite was reported by A. S. Going, P. L. S., and said to occur in the vicinity of Rivers inlet, off Fitzhugh sound, on the Mainland coast, and it is reported that a pit 10 feet deep had been made in it, but it has been found impossible to obtain further particulars of this find, either as to location or quality of the deposit.

Hematite was reported from Sooke district, on the south end of Vancouver Island, but samples brought to the Government Assay office by a prospector proved the ore to be magnetite.

Limonite.

Limonite, or bog iron ore ($Fe_2 O_3 + 3H_2 O$), has been found at several points, but similarly these discoveries have not yet been developed to any extent and the ultimate value of the deposits still remains unknown.

Among the localities reported as having limonite prospects may be mentioned the west arm of Quatsino sound, where a group of 13 claims was recorded during the past summer, and is now held by the Iron Mountain Syndicate, of Victoria; little or no development work, however, has been done as yet.

These claims are situate about one mile from the waters of the west arm, which are navigable at all seasons and for all classes of ships.

The deposits were not examined by this Department, as they were only known of late in the season, but from the description of a prospector who has inspected them, it would seem that they lie in and on the border of a basin, or old swamp, which is at an elevation of 200 feet above salt water and is separated therefrom by a low ridge of hills.

In this basin and on the range of hills adjoining, outcrops are said to have been found for about one mile, while exposures are also visible in the banks of a small creek. No reliable information could be obtained as to explorations made here, but they are certainly superficial and rather indefinite. The iron is probably derived from the leaching and oxidising of sulphides, with which the surrounding hills are heavily charged.

The exact location of the claims on the map is not at present surveyed, but they are, if not actually included in, at least adjacent to, one of the outliers of Cretaceous rocks noted by Dawson.

Later information received from one of the owners describes the land on which they are situated as immediately to the west of the coal lands located at Coal Harbour, which are of Cretaceous age.

Clay Iron Stone.

Clay iron stone, although associated to a limited extent with certain of the coal deposits of Vancouver Island, has not yet been reported in sufficient quantity to make it a probable source of iron, although it is possible that this may be partially caused by the fact that, so far, it has been regarded as undesirable matter, and a market for it may bring forth a limited quantity for fluxing purposes, at least.

In the Queen Charlotte Islands, Dr. Marshall reports clay iron stones associated with the coal deposits there (*see* his full report *re* Queen Charlotte Islands), but in the undeveloped conditions of these properties, it is impossible to form any idea of the quantity of such ore which might ultimately become available.

Magnetite.

There appears to be a remarkable similarity between all the known exposures of magnetite on the coast of British Columbia, as far as geological conditions and surroundings are concerned, and it is probably more than a coincidence that all the notable deposits, if not in contact with crystalline limestone, are at least in the immediate vicinity of it, and occur where it is in close

proximity to the granite of the coast islands. There is also a remarkable similarity, topographically, in these occurrences, as they are usually found on the end or flank of a ridge on a steep shoulder, a fact which may possibly be accounted for by the greater hardness and durability of the mineral offering a better resistance to the forces of denudation. This resistance to denudation has caused the magnetite to stand out in exposed knobs, on and near the older granitic rocks, and the ore bodies being more or less free from underbrush or soil, have in this way been located with very little preliminary work.

As will be noted, most of the iron discoveries have been made on Vancouver Island or the islands of the Straits of Georgia. The Mainland is densely wooded and little explored, and it is quite probable that future prospecting may discover iron there, as the geological formation is similar though more covered with later deposits. While the similarity of occurrence of the various iron exposures is remarkable, it is just possible that this similarity has led to too great generalisation in classifying these deposits as to origin or cause of deposition, and that subsequent work will prove them to be of variable origin.

Of the magnetite iron deposits of the West Coast of Vancouver Island, one point is very noticeable when the known locations are platted on the map, *i. e.*, that these iron discoveries lie on a straight line parallel with and from 10 to 15 miles back from the general west coast line of the Island, and the impression is at once strong that the cause of such deposits must be very closely connected with the general granitic upheaval which uplifted the central portion of the Island, and which sent up spurs or dykes, penetrating the originally stratified rocks.

Such line of mineralisation would conform to the line of outcrop of certain beds of the Vancouver Island series, and would also conform with the probable lines of fracturing caused by the uplifting of such beds by the granite. In a general way, the copper deposits have also a trend lengthwise of the Island.

In the case of almost every one of the magnetite deposits, there are in some part of it quantities of iron and copper sulphides, which render that portion unfit for iron making, and these sulphides seem much more than merely accidental, for with most of the copper properties on the West Coast we have associated magnetite, as, for example, at both the Nahmint and Monitor mines on Alberni canal, and also at the copper properties at Sidney inlet. It would, therefore, seem as though any theory as to the deposition of the magnetite must also take into consideration these sulphides. That part of Vancouver Island lying to the east of the central ridge presents geological conditions similar to the western slope and would be expected to contain similar mineralisation. This eastern slope is, however, as far north as Campbell river, entirely within the land granted to the E. & N. Railway Co., and such land grant carries with it the right to all minerals except the royal metals—gold and silver. The Railway Company now holds this land, and with it all iron deposits thereon.

With regard to the origin of the magnetite deposits, it might be well to quote from a in the paper "American Geologist," 1897, entitled "Secondary Occurrences of Magnetite on Islands of British Columbia by replacement of Limestone and by weathering of Eruptives," by Mr. Jas. P. Kimball, a well-known American geologist, as giving that gentleman's views:—

"The occurrences here referred to clearly conform to two separate types of ferriferous deposits, which it has seemed important to distinguish as hydro-chemical replacements. As previously described, one type is a morphological replacement of limestone by double decomposition between ferrous salts and calcic carbonate, the former being generated from ferrous silicates; the other type, a partial, and not necessarily pseudomorphic, replacement of ferrous silicates in weathered basic rocks, or, as more explicitly distinguished, a residual concentration or fixation of iron oxides incidental to development of soluble alkaline carbonates from weathering oxidation or splitting up of ferriferous silicates."

Further than drawing attention to the remarkable similarity of association, no attempt to generalise as to the nature of the magnetite deposits will be ventured upon, but each case will be taken hereinafter on its own merits.

During the summer of 1902 the Provincial Assayer was requested to examine such of the iron ore deposits of Vancouver Island as were available, and on which some development had been done. As the result of such personal examination, he submits the following reports:—

NOOTKA SOUND.

Nootka sound was not personally visited. As it was far north and the steamer running only at long intervals, it would have occupied more time than seemed justifiable to examine the only iron ore location that could be heard of in this section. The following description of the property was, therefore, obtained from one of the owners, and is believed to be fairly correct.

Glengarry, Stormont and Texas Mineral Claims.

Owners, Dawley, Poole and Grant, of Clayoquot. These claims are situate on Head bay, at the upper end of Thepana arm, Nootka sound. The bay is well sheltered and affords good anchorage for vessels of any size. At about $\frac{3}{4}$ of a mile from the deep water of the bay, and at an elevation of about 800 feet, surface stripping has uncovered a series of exposures of magnetite. These outcrops vary from 7 feet to 40 feet wide, and have been traced at intervals for a distance of 1,800 feet along a contact of crystalline lime and diabase rocks. The ore, judging from the samples seen, would appear to be a clean magnetite in most of the exposures, although towards the east end of the outcrops there appear to be considerable copper pyrites showing. These claims were only located in June, 1902, and as yet have received no development work other than the little surface stripping noted; consequently, while the surface showing seems very promising, it is as yet only a "surface showing," and considerable work will require to be done to demonstrate the real importance of these locations, or to enable any estimate to be made as to the probable ore tonnage. Should further development prove satisfactory, the proximity of the claims to navigable waters would greatly facilitate transportation, which could here be arranged at a minimum initial cost and running expenses. An assay of a selected sample gave 69 per cent. iron.

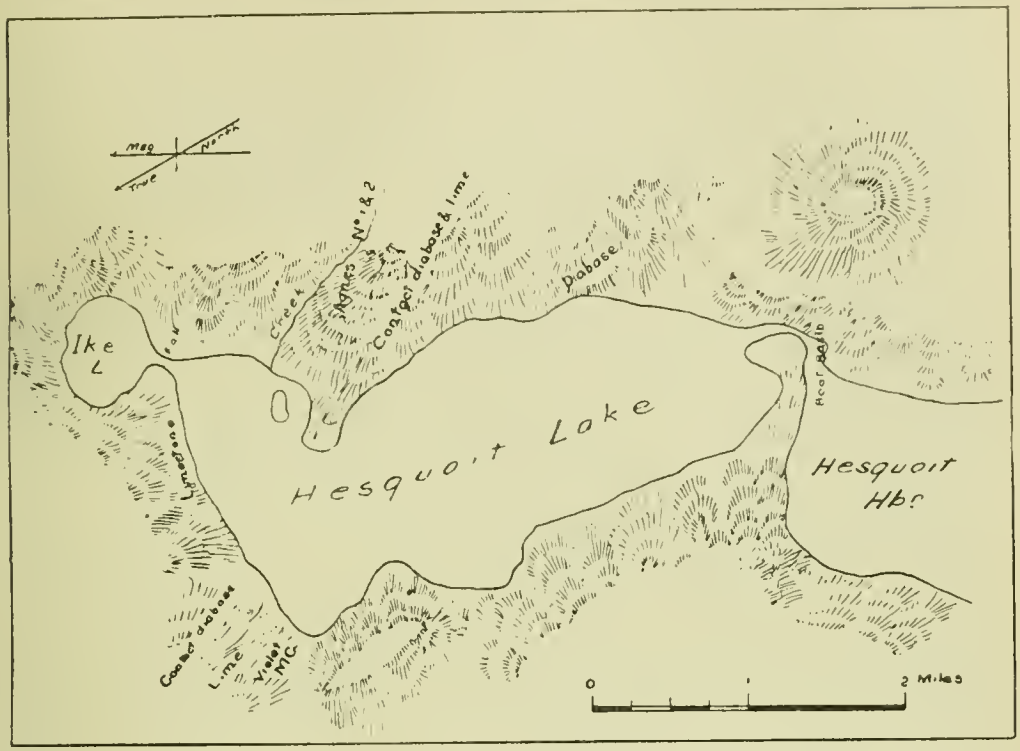
No important deposits of iron could be learned of as located on the West Coast of Vancouver Island between Nootka sound and Quatsino sound. Samples of specular iron were obtained, however, from small outcrops occurring in various places, which, while in themselves unimportant, are here noted both as indicating the possible existence of larger deposits of this ore, yet to be found, and in order to direct the attention of prospectors to a class of ore which has not heretofore been discovered in quantity on the Coast.

HESQUOIT HARBOUR.

Hesquoit harbour, lying between Nootka and Clayoquot sounds, is a small inlet at the head of which is Boat basin, where excellent anchorage for small sized boats may be found, well protected. Hesquoit lake drains into Boat basin through a narrow gorge a few hundred feet long, which at low tide is not more than 10 feet wide, and through which at such times there is a rapid outflowing current of nearly fresh water, while at high tide there is a slight inward flow from the basin into the lake. At low tide there is a depth of 5 feet to 6 feet in the passage, while at high tide a boat drawing 12 feet can pass through the gorge, but at the outlet of the lake there is only about 3 to 4 feet depth. Hesquoit lake is about $3\frac{1}{2}$ miles long by $1\frac{1}{2}$ wide, with rocky shores rising precipitously on all sides.

To the north of this lake and emptying into it at the northern end by a fall and short connecting stream a few hundred yards long, is Ike lake, which is approximately circular in shape and about half a mile in diameter. Ike lake is about 50 feet higher elevation than

SURFACE EXPOSURE OF MAGNETITE–BUGABOO CREEK.



Hesquoit, and discharges over the falls mentioned about 240 cubic feet of water per minute at the lowest flow, providing a small water power which could be cheaply utilised should it be required for the working of any property on the lake. A plentiful supply of timber is also to be had for all mining purposes or for fuel. About 2½ miles up Hesquoit lake from the outlet there appears to be a contact of limestone with an eruptive rock, probably diabase. This contact extends across the lake and into the hills on either side, having a general N. W. and S. E. trend, and along such contact there are several outcroppings showing magnetite, upon which locations have been made.

Agnes No. 1 & No 2.

These claims are situated on the east shore of Hesquoit lake, at an elevation of 175 feet above and some 4,000 feet back from the water, and are reached, at present, by a blazed trail only. The properties are owned by Messrs. Jacobsen, Ike and Roseberry, of Clayoquot, and were located in June, 1902. A small creek runs through the locations, and in the banks of this stream there have been exposed some outcrops of magnetic iron, a few yards in extent only, which form the basis of these locations. Assays of average samples gave about 50 per cent. iron, 13.1 per cent. silica, no copper. These outcrops are apparently on the contact mentioned and extend for some distance. Other than these exposures made by the creek, there is only a little surface stripping, the surface elsewhere being covered by soil. The work done simply proves the existence here of magnetite, and it is quite possible and even probable that further development will prove up a more extensive body of ore.

Violet Mineral Claim.

This claim, owned by F. Jacobsen, of Clayoquot, is situated on the west side of the lake, opposite the *Agnes* and probably on an extension of the same contact already mentioned. The principal outcrop is at an elevation of about 300 feet above the lake and less than a quarter of a mile

back from the water, and is reached by a steep trail from the shore. Here there is an exposure of magnetite some 15 feet wide, developed by an open cut into the hillside, 12 feet long and about 4 to 5 feet deep at the face, showing up very clean and solid ore, a sample of which taken for assay gave 59.8 per cent. iron, 11 per cent. silica, .55 per cent. sulphur and no copper. Some 400 feet higher up the hill there is another small exposure of similar ore. Where the rocks were exposed the ore appeared to lie on the lime diabase contact, which is more clearly defined on this, the west side of the lake. Here again the recent location of the claims accounts for the small amount of work done.

Maggie Lake.

Maggie lake empties through Maggie river into the western channel of Barkley sound. The river is only one mile long and has not a great flow of water. There is a fall 35 to 45 ft. high near its outlet, which effectively prevents the passage of canoes. A very crude trail leads from below the falls to the lake. The lake is about 3 miles long by 2 miles wide, its length lying north and south. The north end of the lake is separated by a steep divide, 1500 feet high, from Kennedy lake, which empties to the north into Clayoquot sound.

Magnetic iron and a strong local magnetic attraction had been reported on Magnetic creek, which flows into Maggie lake from the north, but as there was no trail along the steep shore, it was found necessary to build a raft in order to traverse the lake. This rather slow mode of travel took up all one day, and camp had to be made at the mouth of the creek.

The journey up Magnetic creek was made along the bed of the then nearly dry stream, which was followed up for 4 or 5 miles. The creek bed was examined carefully for float, but no iron ore, either as float or in place, could be found. The bed-rock of the creek is andesite, somewhat similar to that found associated with the iron deposits of Seshart and Copper island. While no magnetite could be found at any point on the creek, a rather remarkable magnetic attraction was observed at a point about 4 miles up the stream, which may possibly be caused by a body of ore under the surface and as yet unexposed. At the point referred to, which is 100 yards back from the creek, the ground is composed of a sandy loam and is heavily timbered, effectively covering up any solid formation. The ordinary compass is here completely under the influence of this attraction, and over a considerable area persistently points to a certain central spot, which can be located within a few square feet, and over which centre of attraction the needle becomes inoperative. The dip needle shows strong attraction over a considerable area, and most markedly so over the central point noted. This phenomenon might be caused by a concealed body of magnetite, and upon such supposition, some 20 feet from the centre of attraction, a pit had been sunk for 12 feet through sand, but had not reached magnetite or even solid formation. Some 60 feet to the north, a tunnel had been driven for 45 feet into the bank, but had struck nothing but sandy loam. The tunnel had caved in at the time the locality was visited. Further than this very marked magnetic attraction and the presence in the vicinity of rocks elsewhere associated with iron deposits, no sign of ore could be found, nor was ore of any sort visible.

Seshart.

Seshart channel connects the middle and the western channels of Barkley sound. Extending along the northern shore of this channel is the Broughton range of mountains, which rise from the water line in gentle slopes to an average elevation of over 3,000 feet. The southern slope of this range appears to be extensively mineralised, and a large number of mineral claims, showing magnetic iron thereon, have been located adjoining each other for a considerable distance along its slope. In examining these claims, it was found that two conflicting sets of locations have been made of practically the same ground. It is not within the province of this Department to express any opinion as to which of these two sets of locations may be valid,

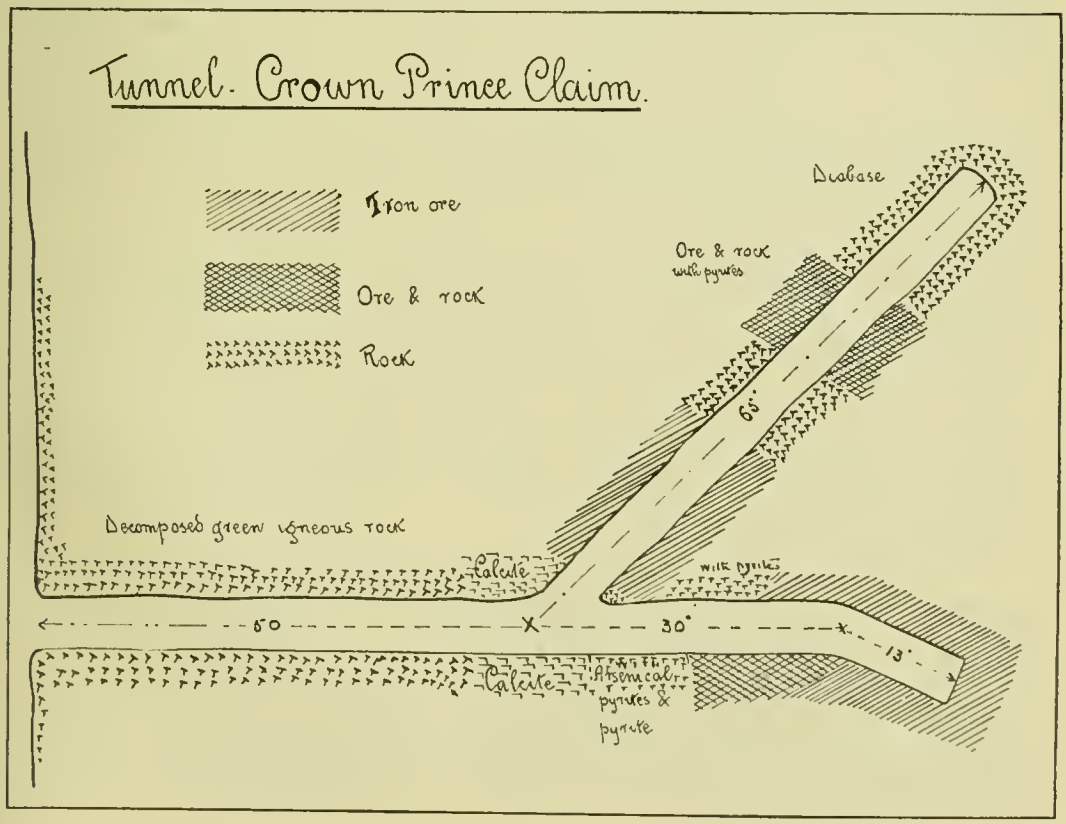
but for the purpose of this report, as designating certain ground, the names of the first locations will be used.

Lord of the Isles.

This group consists of eight claims, namely (proceeding from east to west), the *Standard*, *Crown Prince*, *Victoria*, *Lord of the Isles*, *Emily R.*, *Old Ireland*, *Bald Eagle* and *Western Steel*. It is understood that this lot of claims is held by the Pacific Steel Co., of Seattle, Washington, while a second set of claims covering the same ground is held by the Tacoma Steel Co.

Crown Prince.—The *Crown Prince* is the most easterly of these claims upon which any considerable amount of work has been done. It is reached from salt water at Seshart by a good trail two miles long, and it is at an altitude of 1,600 feet. Surface stripping and quarrying in the steep hillside have exposed, on a conical bluff some 70 feet high and 75 feet wide at the base, a body of magnetic iron ore. On the right hand side of and striking directly into the bluff in a south-easterly direction with a northerly dip of 45°, is to be seen a fairly well-defined body of magnetite which, on the surface, appears to have a width of about 35 feet, but as the north side of the exposure had not been entirely cleared from surface soil and timber, it was impossible to make accurate measurements. Some trenching and stripping which has been done to the north of the bluff has exposed a strong outcropping of magnetite, and as the trend of the first ore body is in that direction, it is possible that this second body may eventually prove to be an extension of the first.

Some 15 feet below the base of the bluff a bench has been levelled off, and this was occupied by a pile of solid magnetite ore. On the level of this bench, and to the right of the



ore pile, a tunnel has been driven into the hill to cut the ore body exposed on the bluff. For some 50 feet this tunnel was run through a decomposed green igneous rock (epidote), when a vein of calcite, showing large and well-defined crystals, was struck. It may be here noted that a vein of calcite of this character is of very frequent occurrence in conjunction with the magnetite deposits of this coast. After cutting through this calcite, a little ore appears on the right side of the tunnel, but this is considerably mixed with mispickel and iron pyrites. No solid iron ore was struck until 75 feet had been run, from which point to the face, a distance of 18 feet, the tunnel is in solid magnetite, the face still being in ore.

For about 15 to 20 feet, before striking the solid ore, the tunnel ran through a band of dark, heavy rock, having a glassy appearance, which same material was noted on the surface to the right of the main ore-showing. This band seems to be much broken and "slickensided" by movement, is unctuous to the feel and carries an amount of magnetic iron considerably higher than its appearance would indicate, a sample taken of the band assaying 34 per cent. metallic iron.

From a point 50 feet in from the mouth of the tunnel, a drift had been run for 65 feet diagonally to the left, which, for some 20 feet, was in ore somewhat mixed with rock and not showing as strong or clean as in the main tunnel, although probably a continuation of such ore. For the next 20 feet the drift was in magnetite much mixed with rock, and with iron pyrites much in evidence. The remaining 25 feet of the drift is in a diabase rock, showing no ore. The ore body dips to the right, and it is probable that this drift has been run underneath it, while if the drift had been set off to the right from the tunnel instead of to the left, it might have struck the same ore as is exposed in the main tunnel. A sample taken of the ore gave the following analysis:—48.4 % iron, 0.7 % sulphur, trace phosphorus, trace titanium, no copper.

Victoria and Lord of the Isles.

The *Victoria* adjoins the *Crown Prince* on the east and the *Lord of the Isles* adjoins the *Victoria*, also on the east. No further work and no new developments have been made on either of these claims since they were reported on in the Mines Report of 1899, so that no further description need be given.

Bald Eagle.

This claim lies to the west of the *Lord of the Isles*, the *Emily R* and *Old Ireland* intervening, but on these latter no new work has been done. The *Bald Eagle* is at an altitude of about 1,500 feet, and here there is on the hillside an exposure of magnetite some 50 feet long, which is also exposed on the bluff for 35 feet vertically. This body of ore is fairly solid magnetite, but is somewhat contaminated with iron pyrites. About 40 feet below this exposure of magnetite, a tunnel was started and was run directly into the hill for 72 feet, underneath the surface exposure. At the end of the tunnel a drift was run to the right for 45 feet. No ore was struck either in the tunnel nor in the drift therefrom. A sample taken of the ore as exposed on the surface gave the following analysis: iron, 62.2 %.

Western Steel.

The *Western Steel* adjoins the *Bald Eagle*, is the most northerly claim of the group, and has an altitude of 1,200 feet. The showings on this claim are much the same as on the *Bald Eagle*. A small shaft has been sunk, which was full of water when the property was visited.

All the claims in this group are easy of access and favourably situated for the transportation of ore, which would probably be done by a comparatively short aerial tramway to the beach and thence by steamer to the smelter. There is timber on the claim sufficient for mining purposes, but no water power.

Anderson Lake.

Uchucklesit harbour is an arm or bay making to the north from the east end of Barkley sound and near the entrance to the Alberni canal. About half a mile from the inner end of the bay and connected therewith by a narrow channel, some 200 yards long, lies Anderson lake. This lake is 11 or 12 miles long by about 1½ miles wide, and, as was found by platting a rough survey made at the time, runs nearly parallel with Effingham inlet, being separated therefrom by a sharp, narrow range of hills. At highest spring tide only is there a flow from the bay into the lake; during the rest of the time the flow is outward and is fresh water. The Dominion Government this past summer had a number of men employed in clearing this passage of boulders and building cribwork along the side, so as to admit of the passage of canoes with supplies.

Iron Mountain Mineral Claims.

These claims, which were only located in the summer of 1902, are owned, by George Brown, of Alberni, and consist of the *Iron Mountain No. 1*, *No. 2* and *No. 3* mineral locations. They are situated on the west shore of Anderson lake, about 7 miles from the outlet, where a small creek flows in. About 200 yards from the lake and about 100 feet above it, on a bluff which forms the bank of the creek, are several outcrops of solid magnetite. From this point the mountain rises abruply, and at an elevation some 250 feet greater other outcrops of magnetic ore were visible, which extended around the face of this bluff for some 250 feet. While there is undoubtedly strong mineralisation by iron at this point, no work has been done to show the extent on the surface of such exposures. Should a body of ore be here developed, it could be easily loaded on scows on Anderson lake, but the outlet would require considerable work to permit of the passage of such scows to the sea. Analyses of a few samples gave the following average result:—iron, 55.7 %; silica, 20.3 %; sulphur, 0.3 %.

Alberni Canal.

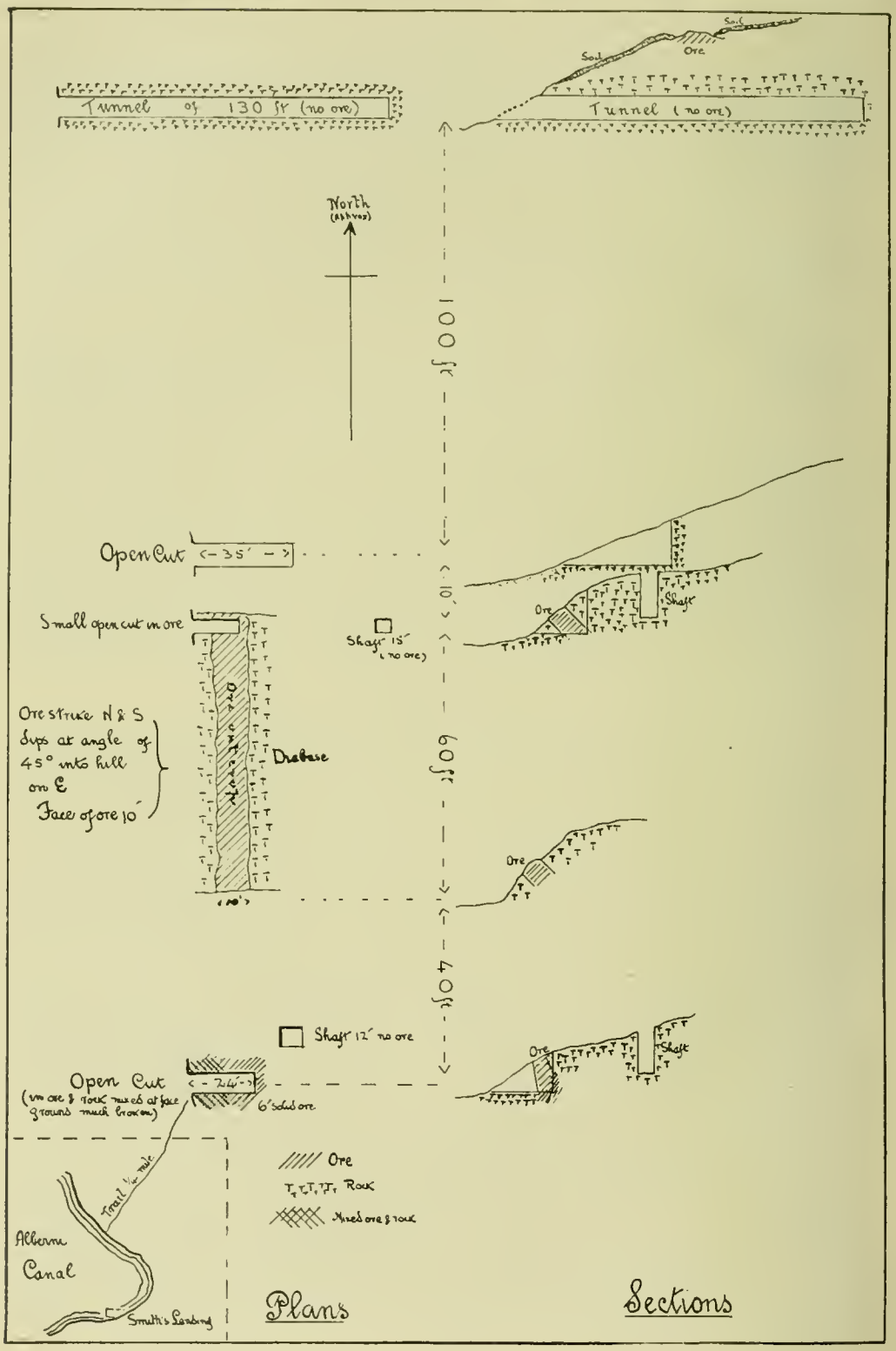
Darby and Joan Mineral Claims.

These claims are held by George Smith, P. L. S., of Alberni, and are situated on the east side of the Alberni canal, about a quarter of a mile back from and at a slight elevation above the water at Smith's landing (some 18 miles from Alberni), where good shelter for a small boat may be had in a little bight that "makes" at this point. Some surface quarrying and a few small cross-cuts have exposed a face, some 60 to 90 feet long by 10 feet wide, of magnetic iron ore, running along the hillside and apparently dipping into it, to the east, at an angle of 45°. The principal development work consists of two open cuts, one at either end of the exposed ore deposit, and both cutting into ore at the face, as shown in the accompanying sketch.

The development has been so far satisfactory. The ore-body, as exposed on the surface, is nearly solid, clean magnetite, and is well defined by the inclosing diabase walls. A rough, but approximate, average sample of the ore on the dump gave the following analysis:—iron, 55.9 %; silica, 16.0 %; sulphur, 1.0 %; no copper. The facilities for cheap mining and transportation are here all that could be desired, and the supply of timber and water is unlimited.

Defiance and Defiance No. 1 Mineral Claims.

These claims are situated immediately behind the *Happy John* and *Monitor* claims on the north-west side of the Alberni canal. As the land rises rapidly from the sea the altitude of these claims must be 1,000 feet or more. The claims are owned by Messrs. Morine and Commofort, of Alberni. This property could not be visited, but I was informed by a prospector who had been over the ground that there is a very large surface deposit of magnetite which has been exposed by a considerable amount of stripping. As *Defiance No. 1* was only located in



SKETCH OF WORKINGS, DARBY AND JOAN CLAIMS.

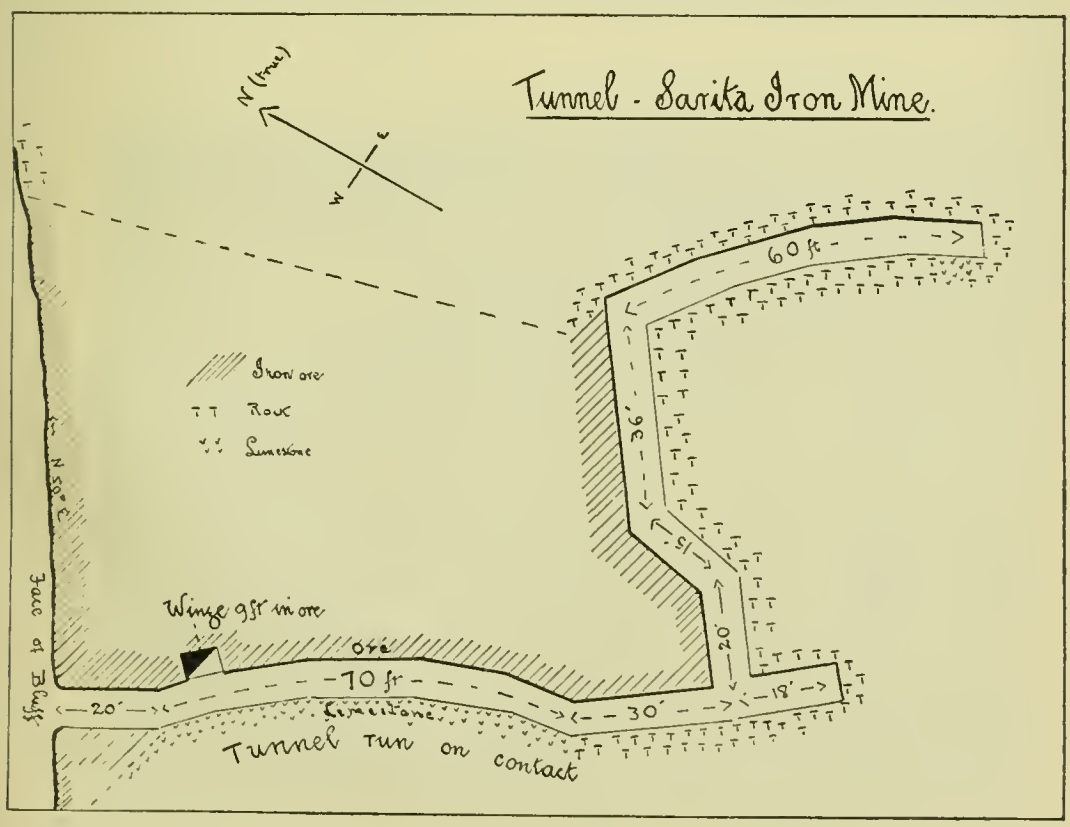
April, 1902, these claims have as yet not been prospected in a manner to prove the thickness of ore; this it is, however, proposed to do in the near future. The ore could be easily transported to deep water by aerial tramway.

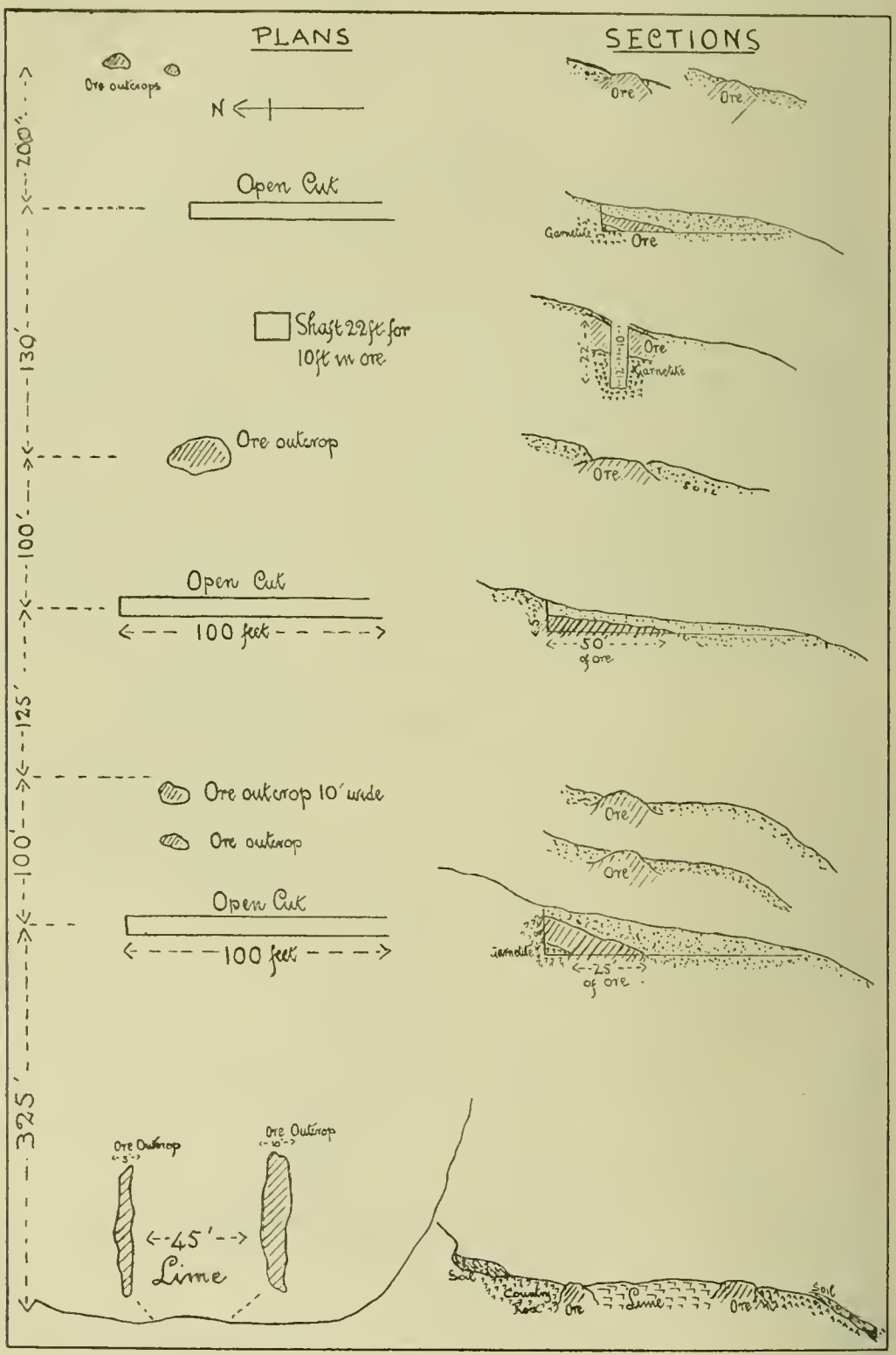
Sarita River.

Sarita Iron Mine.

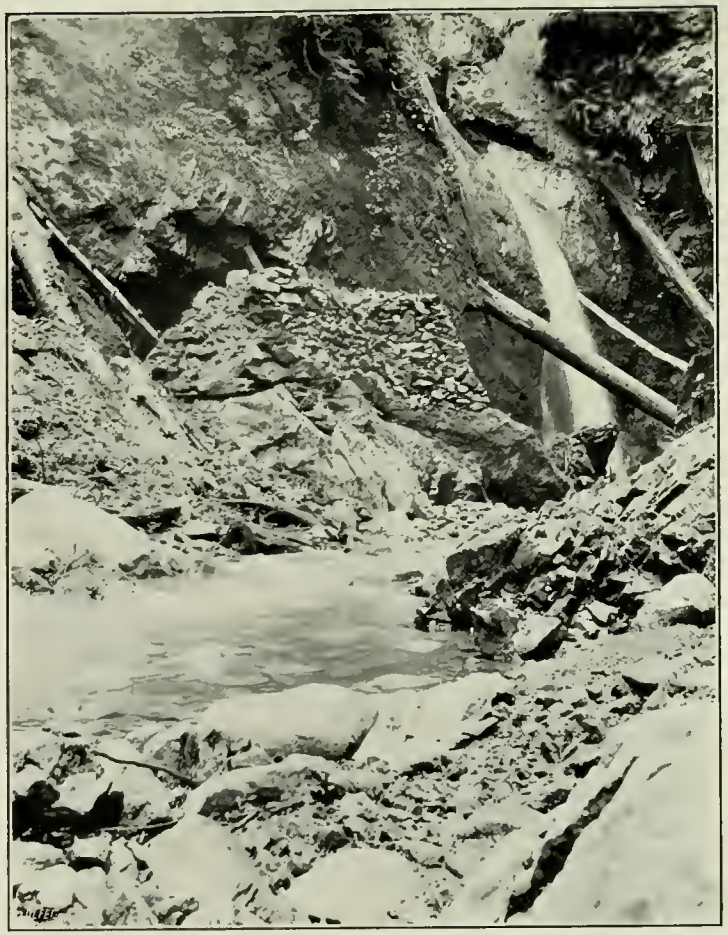
The Sarita river flows into Barkley sound from the east, at a point 12 miles from the ocean and directly opposite Copper island. The Sarita Iron Mine consists of several mineral locations (one of which is Crown-granted), now held by the Pacific Steel Co., of Seattle, which company also holds a lease from the Dominion Government of some 55 acres of land adjoining, being part of the Indian Reserve. Magnetite has been known for many years to outcrop at a spot almost a quarter of a mile back from the south bank of the Sarita river, and a mile from its mouth. The iron outcrops, as far as could be determined by reference to the official plats, but without actual survey, would be wholly outside of the Indian reserve noted above. There is a trail from the beach, opposite Santa Maria island, $1\frac{1}{4}$ miles long, leading across swampy land to the mine, but the easier way to reach the property is by canoe up the river for about one mile to a small cabin on the south bank, from which there is a good and level trail.

About $\frac{1}{4}$ mile from the river, and running parallel with it in an east and west direction, there is a long, low ridge from 60 to 150 feet high, rising at the lower end out of swampy ground, through which a creek flows into the Sarita. The western end of this ridge terminates in a bluff about 60 feet high and 200 feet wide, part of the face of which has been cleared off, showing solid magnetite for the full 60 feet height of the bluff, and with a width of 92 feet,





PLAN SHOWING ORE OUTCROP ON RIDGE, SARITA IRON MINE



MAGNETITE EXPOSED BY BUGABOO CREEK TO DEPTH OF 40 FEET.

OPEN CUT THROUGH MAGNETITE—IRON MINE, COPPER ISLAND.

but enclosing in this width some 14 feet of country rock, while towards the top of the exposure a large wedge of crystalline limestone shows embedded in the ore. The ore body is bounded on the south by a mass of highly crystalline limestone, and on the north by a greenish fine-grained and apparently much altered volcanic rock. To test the extent of the ore body a tunnel was driven, starting just above swamp level, at the base of the ore exposure and on its contact with the limestone lying to the south. This contact was followed in a south-easterly direction, or nearly with the ridge, for about 70 feet, the tunnel showing solid magnetite on the left and limestone on the right hand side. At 70 feet in the lime gave place to the country rock, and the tunnel, following the ore contact, was deflected a few degrees to the left. The contact was followed for about 30 feet, when the ore, heretofore present on the left hand side, gave out. The tunnel was pushed ahead in the same direction for an additional 18 feet, but without striking any more ore. At the point in the tunnel where the ore gave out a drift had been started in a north-easterly direction and, with certain small bends, had been kept in this general direction, parallel with the face of the bluff, for about 71 feet. The right side of this drift was in country rock all the way, but good solid magnetite formed the left side for the first 30 feet, after which a little ore on the floor was all that could be seen, and even this disappeared before the first 71 feet of the drift had been run. At this point, 71 feet in, the drift was deflected sharply in a south-easterly direction, or nearly parallel to the main tunnel, and was run in this direction for about 60 feet, cutting all the way through barren country rock with but a few bands of limestone showing near the face. In the main tunnel, 30 feet from the mouth, a winze had been sunk on the left side for 9 feet; it was full of water at the time, but was reported to have been sunk on solid ore.

The surface, on the top of the ridge, has been cleared by the surface stripping for a short distance back from the face of the bluff, which stripping exposed a band of limestone 45 feet wide, running with the ridge, with 5 feet of ore on the north and 10 feet on the south side. The depth of the surface exposure has not been determined. Following the crest of the ridge back in an easterly direction, a number of open cuts and surface strippings were noted over a distance of 1,000 feet, and in most of these clear magnetite has been struck, and the ore appears to be fairly continuous for that distance along the brow of the southern slope, just where the comparatively flat top of the ridge breaks off to the slope. Several level cuts or trenches have been made into this magnetite exposure from the slope, as shown in the accompanying sketch, while at 1,000 feet from the terminal bluff face a shaft had been sunk on the exposure and was down 22 feet at the time, the first 10 feet cutting through ore but the remainder being in country rock, probably a garnetite. The ore taken from the tunnel, and from the bluff at the western end of the ore body, has been piled up in front of these workings and is estimated at about 1,500 to 2,000 tons. This ore is very clean, solid magnetite, quite free from sulphides, though containing a little calcite scattered through it, apparently of secondary occurrence. A sample taken of this ore dump gave the following analysis:—63.7 per cent. iron, 3.85 per cent. silica, .3 sulphur, trace phosphorus, no titanium. A route for a tramway from the ore pile to deep water has been surveyed, and it has been found practicable to obtain a nearly level grade with a total length of 2½ miles (*see* also p. 223).

Copper Island.

Tzartoos, or Copper island, as it is better known locally, is the largest of a chain of islands running north and south in Barkley sound and separating the eastern from the western channel. The island derives its name, Copper island, from the discovery by Captain Wm. Spring, during the pioneer days of trading on the West Coast of Vancouver Island, of a small vein of copper pyrites occurring at high-water mark on the east coast of the island, but which deposit has not

since proven to be of commercial importance. Copper island rises on all sides abruptly from the sea, forming a ridge, the highest part of which has an altitude of almost 1,000 feet. In 1894 the iron deposits of the island first attracted attention, when a number of claims were located.

Copper Island Group.

The group comprises the *Mountain*, *Barclay*, *Clifton*, *Charmer*, *Pilot Fraction*, *Rainbow* and *Sunbeam*. The claims are reached from Clifton point, near the middle of the east coast of the island, by a foot trail. The most important development work has been done on the *Mountain* claim, situated about 1,575 feet from, and 700 feet above, the sea. At this point considerable surface stripping and quarrying has been done, exposing a large mass of magnetite, so irregular in outline and shape as to preclude even approximate measurements of it being given. There is, however, a considerable amount of clean ore distributed in the rock, over a surface 40 feet wide by 70 feet long. At the base of the small rise on which this exposure occurs, an open cut has been run directly into the hill for some 50 feet. The first part of this cut was through nearly solid magnetite for its depth, viz., from zero at the beginning to about 8 feet at 30 feet in, where the ore is cut off sharply, as though by faulting, although, as shown in the remainder of the cut, there is a continuation of the ore a few inches thick along the surface for some distance further up the hillside. A small shaft, 12 feet deep, has been sunk on the right hand side of the open cut at that point where the ore shows thickest. This shaft was full of water, but it is reported to have been sunk in ore. Slightly above this cut and to the north a few shots have been put into the surface, and showed fairly clean magnetite.

On the same level as the cut just described, but some 50 feet to the north, a second and parallel cut has been made, which shows ore on the right but not on the left hand side, being apparently on the north edge of the ore body. This cut was run for some 35 feet as such, but from this point had been continued for some 27 feet in the same direction as a tunnel, in which a small body of ore showed in the right hand side, but apparently not connected with that seen in the open cut. At 27 feet in from the mouth of the tunnel proper, drifts have been started off at right angles, that to the left having been driven some 6 feet and that to the right 12 feet, while the tunnel had been continued with a deflection of 25° to the left (southwest) for an additional 75 feet. The only magnetite seen in these underground workings, other than that near the entrance, was a very small showing of ore in the north drift. The face of the tunnel is almost 70 feet vertically below the surface. The work had been done, apparently, in the expectation of striking at this depth the large surface exposure of magnetite already mentioned, and certainly the tunnel has been so run as to strike any probable extension of such body with depth, but has not been successful in finding any continuation of the ore-body. The ore taken from these various workings has been piled up on the dump, forming a pile of about 1,500 tons of very clean-looking and nearly solid magnetite.

From these workings to the top of the mountain, some 250 feet higher vertically, and, in fact, practically over the entire rounded top of the hill wherever the rock is exposed, magnetite is to be seen intercalated with a garnetite country rock and sometimes presenting the appearance of an ore breccia.

The ground over this area has been prospected at intervals by some 20 open cuts. The topography of the ground would admit of the cheap construction of an aerial tramway from the ore dump to the sheltered bay, where a dock could be cheaply built, and where vessels could lie in shelter while loading.

An average sample of the ore on the dump gave the following analysis:—iron, 50.4 %; silica, 18.6 %; sulphur, 0.3 %; phosphorus, 0.053 %; titanium, trace; copper, none (*see* also pp. 223-224).

Port Renfrew.

Port Renfrew, or Port San Juan as it is locally known, is an open roadstead on the south-west coast of Vancouver Island, and is a port of call for steamers plying up and down the West Coast of the Island. Two good-sized streams flow into the bay, the San Juan from the east and the Gordon from the north. The country rock on the east side of the harbour is chiefly slate, while on the west side diabase and diorite are most in evidence, the diorites occasionally showing gneissic structure. This same formation is found up the Gordon river and its principal tributaries, but with the addition, on the upper reaches, of a very highly crystallised limestone. A considerable number of mineral locations, covering showings of magnetic iron ore, have been recently made in this section, but time only permitted of the examination of those on which some work had been done.

Rose Group. A syndicate of English capitalists, represented in British Columbia by Mr. H. S. Newton, of Victoria, has obtained control of a number of such iron locations, and these have been consolidated into a group on which development work is being pushed, the actual work being chiefly confined to the *Rose* claim. The camp is situated on the north bank of the Gordon river, about six miles from salt water, and is connected therewith by a good trail, but all mine supplies, etc., are brought up by canoes, except at very high or low stages of the river.

Close to the camp a shaft had been sunk about 300 feet, on a magnetite outcrop, which appeared to dip into the hill. At about 100 feet down this shaft a cross cut drift of 40 feet had been run to the north. This drift was not examined. It was reported by the foreman to be boarded up and all work had been suspended for the time at this point, but it was stated by the management that the drift had been run for about 40 feet, and had cut diagonally through about 18 feet of ore mixed with country rock. Similar drifts had been set off at the 200 and 300-foot levels, simultaneously, that at the 200-foot level being now in about 18 feet, and that at the 300-foot not so far. In neither of these drifts, nor in the shaft, was any ore visible, the rock driven through being chiefly diorite, though, of course, these drifts had not been driven far enough to strike the ore outcrop, should it continue to this depth at the surface dip. The equipment consists of a one-drill Rand air compressor and a small power hoist, both operated by steam.

Baden Powell and Little Bobs. These claims are situated about three miles further up the valley than the *Rose* group, and have recently been bonded by Mr. Newton's syndicate, which is now building a waggon road up to them from the lower camp at the *Rose* claim. The trail rises gradually up the hillside until an elevation of 800 feet is attained, at which point surface stripping has exposed on the side of the mountain two outcroppings of magnetite, 120 feet and 20 feet wide, and from 30 to 50 feet high, on the steep hillside, which slopes at an angle of about 40° to the river below. No work has been done other than the stripping necessary to show up the exposures mentioned. These show on the surface of the bluff very clear, solid magnetite, which, from its occurrence, will be easily and quickly prospected by a cross-cut tunnel, that will require to be driven, however, before it can be determined to what thickness the fine surface showing extends, and without which no present estimate of possible tonnage can honestly be made. A sample from the surface gave 63.6 % iron and 1.5 % sulphur.

Bugaboo. This location is held by Messrs. Bently and McGregor, of Port Renfrew, and is reached by a trail from the *Baden Powell*, two miles in length. The claim is situated on Bugaboo creek, a small tributary of the Gordon river, at an elevation of 1,400 feet. The creek has cut through a body of magnetic iron ore for about 100 feet. This ore body, as exposed in the bed of the creek from bank to bank, is about 80

feet wide, while some surface stripping on either side has further exposed it. A lime-diorite contact appears to cross the creek here diagonally, the crystalline limestone being on the down creek side, and on this contact the ore appears to have been formed. A small waterfall has been developed in the creek by the solid body of iron ore in the canyon, below which, and on the lower side of the ore body, a drift has been run into the bank, some 40 feet below the top of the ore exposure, which drift is in for 10 feet in solid magnetite. The outcrop is well defined and is remarkably free from admixture with country rock, being nearly pure magnetite, although occasional patches of iron pyrites were visible. This is one of the most promising prospects seen on the Coast, and is well worth serious development, as the ore could be very cheaply mined and transported down the valley, though it would require a railway of about 12 miles to transport it to navigable waters at Port Renfrew. There is sufficient water power and timber convenient for all mining purposes.

I was informed later that there are some other exposures back from the creek. These I did not examine, not having heard of them at the time of my visit. Samples of the ore gave the following analysis:—69.2 % iron, 2.7 % silica, 0.5 % sulphur.

Sooke.

Magnetic iron has been known for many years to exist at Sooke, on the peninsula to the east of Sooke harbour, where there are very extensive surface exposures. These deposits were mentioned by Dr. Dawson in 1887, who said:—"The deposit is rather of the nature of stock work than a true vein, but can be traced for some distance in a N.E.-S.W. direction, and in places shows from 10 to 20 feet of nearly pure ore. The country rock is a crystalline diorite, containing much hornblende."

Assays on specimens of the ore gave from 49 to 72 % metallic iron, the samples being all taken from very near the surface. A sample of the country rock from this locality was recently sent to Dr. Barlow, petrographer to the Geological Survey of Canada, who reports as follows:—"The hand specimen shows a porphyritic rock made up chiefly of pale, yellowish-green phencrysts of plagioclase, with very little ground mass. Under the microscope it seems to be an olivine diabase made up chiefly of plagioclase, probably labradorite, olivine, pyroxine and hornblende. Much of the olivine has been converted into serpentine with the separation of iron ore."

Ralph Mineral Claim.

This claim is situated on the headland of East Sooke, near the entrance to the harbour (near lot 111). A short distance back from the beach, and about 100 feet above sea level, there is a large surface exposure of magnetite, which was located some years ago by Mr. Wm. Ralph, who did considerable work on the property, but more with the expectation of discovering copper in paying quantities, under the iron ore, than with the idea of actually working the property for the iron itself. Although there is more or less copper ore all through this claim, associated with the magnetite, it has not been found as yet of a grade to pay for extraction, unless the mixed ores could be used by the copper smelter as an iron flux. Copper ore has, however, been quite recently discovered in quantity on an adjacent claim. In some years past, however, no work has been done on the property. A shaft had been sunk on the outcrop to a depth of 15 feet, but is now filled with water and could not be examined. On the dump, however, there was a pile of magnetite containing a notable percentage of copper pyrites. A tunnel had been run into the hill from a point 50 feet below the surface at the shaft, with the evident intention of striking at that depth the ore-body met with in the shaft. This tunnel had been run for 15 feet, but had not gone through the surface soil and, of course, had not reached the ore. Near the shaft there are several exposures of solid magnetite on the surface,

but no work has been done to show what they may develop with depth. While there is undoubtedly much pure magnetite in this deposit, and specimens of any desired purity may be obtained, it is questionable whether iron ore could be mined which would be sufficiently free from copper to be of value as such.

At a later date the writer learned from Mr. Ladd, the local manager of the Pacific Steel Co., that his company had held a bond and done considerable work on another iron exposure on the Sooke peninsula, more to the eastward and back of the old copper mine on the beach, on or near lots 79 and 83. This property was not visited, as it was not known of when the writer was in the vicinity, but the following information was given by Mr. Ladd:—"In 1900, Mr. Homer Swaney, on behalf of the Pacific Steel Co., took a bond on this property, and proceeded to demonstrate the quantity and quality of the ore-body. He made a number of open cuts at various points, expending a considerable sum of money in such work, proving that there was here quite a large body of magnetite, but that it was so contaminated with copper as to be valueless for his purpose—iron-making; consequently, the bond was allowed to lapse."

Malahat Mountain.

Malahat mountain forms a portion of the divide between Shawnigan lake and Saanich arm, and is most easily reached from Shawnigan station, on the E. & N. railway, the trail leaving the track about two miles south of this station. The trail gradually ascends the mountain in a southerly direction and in about two miles reaches a small, rolling plateau which forms the summit, the elevation being about 1,600 feet above sea level, or 1,100 feet above the railway track. A series of several claims has been located across this divide, extending towards and reaching almost to salt water in Saanich arm. All the claims on which any work of importance has been done were examined, although attention was particularly directed to those locations on which iron ore was visible.

Jumbo Mineral Claim.

The *Jumbo* mineral claim is situated on the Shawnigan lake slope of the divide, at an elevation of about 1,385 feet above the sea, or 900 feet above the railway, and is held by Mr. Palmer and others of Chemainus. A tunnel has been run into the hillside below an outcrop of magnetite. At 30 feet in, this tunnel had cut into a well-defined deposit of nearly solid magnetite, dipping into the hill at an angle of about 30°, and the face of the tunnel was still in solid ore, the hanging-wall not having yet been reached. The outcrop was not such as to give any idea of the thickness or width of the ore-body, while more work requires to be done in the tunnel to prove the ultimate thickness of the deposit. The ore on the small dump at the tunnel mouth shows mixed with the magnetite in places some arsenical iron pyrites and a little copper pyrites.

Chemainus Mineral Claim.

This claim is situated below and adjoining the *Jumbo* and nearer to Shawnigan lake. A shaft had been sunk for 20 feet on an outcrop of magnetite iron ore, mixed with a little copper pyrites. The shaft was full of water when visited and so could not be examined, but is reported to have been still in ore at the bottom when work was discontinued.

Eagle Mineral Claim.

The *Eagle* adjoins the *Jumbo* on the upper side, the work being at about 50 feet higher elevation. The claim is evidently on the same zone of mineralization as all the other iron properties, but on this property the mineralization is chiefly pyrrhotite, chalcopyrite and pyrite, of which a rough average sample taken over an exposed face in a cut 8 feet wide gave:—Cu., 1.3 %; gold, .02 oz.; silver, 1 oz. Although this is not an iron property, it is on the same zone and adjoining, and is here noted for that reason.

Malahat Mineral Claim.

This claim is situated on the summit of the divide, at about 1,100 feet above the railway or 1,600 feet above the sea. A tunnel had been run for some 18 feet, in a dark diabasic rock, at the inner end of which a winze had been sunk 6 feet. The rock in the shaft is a coarse-grained diorite enclosing bands of solid magnetite a few inches wide, but not revealing any ore-body of commercial importance.

Star Mineral Claim.

The *Star* mineral location lies 1¼ miles east of the *Malahat* and on the Saanich slope of the divide. Surface stripping had uncovered an outcropping of magnetite, but no attempt was made to sink on this showing, although, at a point 70 feet distant and 30 feet lower elevation, a tunnel had been started and had been driven for 156 feet, running below this outcropping. About 78 feet in from the mouth of the tunnel and vertically under the outcrop a drift was run diagonally to the left for 30 feet, while another was set off to the right for 27 feet, and at the inner end of the tunnel another drift had been made to the left for 15 feet. The rock cut in these workings was chiefly diorite and diabase, with occasionally streaks of lime, but in no place in either the tunnel or the drifts could any ore be seen. No further work is being done on the property.

Last Chance.

This claim adjoins the *Star* on the lower side, nearer Saanich Arm. A little work has been done on a natural cave in highly crystalline limestone, but no ore of any sort was to be seen, either in the cave or on the outside.

Redonda Island.

The iron deposits on this island were examined by Mr. Carmichael in 1901, since when no further development has been made, so that they were not re-visited this year. The following is a reprint of Mr. Carmichael's report for 1901 :—

Redonda Iron Mine.

"This property was located as the *Elsie* mineral claim in 1892, and was Crown-granted by De Wolf & Monro, of Vancouver, in 1895. It is now under bond to Hewitt & McIntyre, of Tacoma. The mine is situated on the north shore of West Redonda island, about S. 11° W. from Elizabeth island in Pryce channel. The north shore of the island rises very abruptly from the sea to a height of over 3,000 feet, and is entirely composed of gray hornblendic granite, generally notably coarse in grain, and occasionally porphyritic, and in some places holding dark, highly hornblendic portions. The outcrop of ore is situated at an altitude of 450 feet, and so rapid is the rise that the mountain side could not be climbed if it was not for the foothold afforded by the standing timber. A clearing was made at this elevation and, during the year 1893, 626 tons of magnetic iron ore were taken out and shipped to the Oswego Iron & Steel Company's furnace in Oregon. This work has exposed an open face of solid magnetite 30 feet wide by about the same height. The ore lies between limestone and an intrusive light gray granite, with the walls well defined; strike, N. and S.; dip, 65 E. I was unable to form an opinion as to the continuity of the ore-body with depth, as the solid ore disappears beneath the loose ore at the bottom of the cut. The surface all around this outcrop is heavily timbered, and no further work has been done to uncover the ore-body than the open face just mentioned. A short distance below is an ore bin and a chute to the beach, but these are now quite rotten. The water is very deep right up to the beach, and steamers of any size could be easily loaded from a floating wharf."

Since investigations for this report were undertaken, there have been numerous reported discoveries of bodies of iron ore, some of which are reliably vouched for, while others are mere hearsay. Most of them are at remote points, and as no development has been done to prove whether they are mere surface deposits, they are given as reported iron deposits.

Cowichan Lake.—Among the above there is an authentic report that a body of iron ore, said to be hematite, exists a few miles up Nixon creek, a small creek flowing into Cowichan lake from the south-west. The property has not been staked as yet, and the informant did not care to give its exact location.

Nimpkish Lake.—Mr. W. D. Snyder, a Licensed Assayer, reports that while prospecting up the Klaanch river, about one day's journey up from the lake, he came across a large surface exposure of magnetite, which from its isolated position he did not consider worth staking. The sands therefrom, however, he found on panning to contain a considerable amount of native gold, probably from the weathering of auriferous sulphides.

The recent discovery of a large body of iron ore is reported as having been made near Campbell river, on the east coast of the Island, on land held by the E. and N. Railway Co. Particulars of this reported find are not available.

With reference to certain of the foregoing reports, Mr. Carmichael, the Provincial Assayer, requested the Provincial Mineralogist to visit the deposits on Copper island and on the Sarita river, in order to consult with him as to certain points regarding them, and to confirm, if possible, his own examination of the two properties, which he considered to show up the greatest amount of iron ore of any of the localities of the West Coast of Vancouver Island. In consequence, the Provincial Mineralogist left Victoria on 31st of October, 1902, arriving at Alberni, *viâ* Nanaimo, on the afternoon of Saturday, November the 1st. Mr. Carmichael had the steamer "Willie" (Capt. Huff) ready waiting, and the run was made down the Alberni canal to Copper island, Barkley sound, arriving there at 8 p.m. and anchoring only just in time, for within half an hour the severe storm of that night arose, which would have been impossible to withstand in the open in such a boat. The steamer was anchored in a small cove on the east side of the island, immediately below the iron deposits, at the place where a wharf would be built for shipping the ore, so that the storm, one of the most severe of the season, tested practically the sheltering qualities of the cove, which proved to be so perfect that no motion of the boat was felt during the night. At a very small cost a wharf could be built here which would accommodate one good-sized vessel, while bunkers could be built on the solid shore rocks; in fact, the situation is ideal for shipping arrangements on a moderate scale.

Copper Island.

The details of this property are as contained in Mr. Carmichael's report (*see* pp. 217-218). The most important showing of ore is that in the large open cut to the left of the tunnel, some 700 to 800 feet above sea level. The tunnel is important only as negative evidence, viz., that the ore does not go down at this point. On the knoll where the ore exposure referred to occurs, the surface stripping has exposed, for some 50 feet, the country rock mixed with magnetite, in no regular form, but with the "mixture" showing a distinct "flow" structure, the magnetite having the appearance of a brecciated mass with the interstices filled with the country rock, which latter is so altered as to leave its original origin obscure, but it appears to be an altered volcanic rock. At the spot where the cut referred to has been made, the ore masses are larger than elsewhere noted, one of them being 30 feet through, approximately cubical in shape, with distinctly defined corners, and consisting of solid magnetite almost entirely free from other mineral. This has been cut through in the workings and largely mined out. Further in the cut the country rock, practically free from iron, shows under foot and slopes upwards parallel to the surface of the hill. The small shaft, 12 feet deep, is reported by the management as being in solid ore, but as having struck country rock at the bottom.

It would appear here (and this is strengthened by other investigations further up the hill) that there is, lying on the surface, a zone of greenish country rock, apparently resting on a

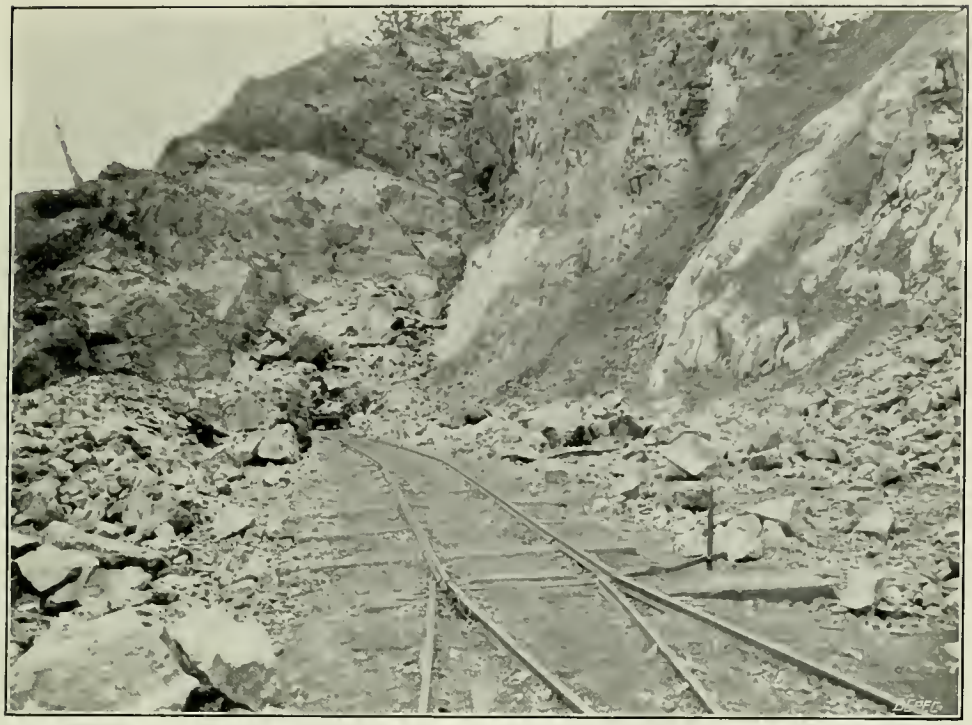
very similar rock. This zone is shown in places to be 20 to 30 feet thick, while in others it is only a few inches thick. In it there occurs magnetite in the shape of masses, showing defined sides and angles of lenses and stringers, with often sheets a sixteenth of an inch thick; but all of this magnetite, whether in large or small masses, is practically clear mineral. The appearance presented by this mixture of ore and rock can best be described by quoting from "Kemp's Ore Deposits," page 63:—"The concentration of the magnetite seems to the writer best explained by its settling in the still molten mass until it formed considerable aggregates. When once these rich aggregates have formed they may, in the process of eruption or intrusion, take almost any place in the resulting rock."

The occurrence of the ore on this hill has the appearance of a partially solidified magnetite aggregate, caught up and included in a volcanic flow, which might have been an overflow or an intrusion, and which has since been subjected to great flexure and faulting, with subsequent denudation, arrested at the present point by the durability of the magnetite, and leaving the surface of the hill, as it is now, practically coated with magnetite, in some instances not one-sixteenth of an inch thick, and in others several feet. The proportion of magnetite in various parts of the rock varies very much, and where a notable amount is present it is indicated by a knoll on the brow of a ridge. There is no limestone now visible in the vicinity of this magnetite exposure, but such does occur on the same range of hills about a quarter of a mile to the northward, and forms the greater portion of the north end of Copper island. The geology of this island is quite in keeping with the description given of that of Vancouver Island in general. Numerous dykes were noted which seem to be of more recent date than the ore deposits, although this is not very clearly demonstrated.

Of "probable ore" there is undoubtedly a considerable quantity over the exposed area, of which, however, but a small percentage could be mined to run 50 per cent. Fe. without concentration. If, on the other hand, crushing and magnetic separation were resorted to, many thousand tons of rocks carrying from 20 to 30 per cent. Fe. are available, and would give a concentrate of from 60 to 65 per cent. Fe. From the development done, it is impossible to make any calculations as to the cost of mining and handling such an ore-body, and it is, consequently, equally impossible to say how much ore can be obtained from here and handled at a commercial profit.

Sarita Iron Mines.

The Sarita river properties were visited on the afternoon of the same day, in company with Mr. Ladd, the local manager of the Pacific Steel Company. The details of these claims are as contained in Mr. Carmichael's report, and the sketches are essentially correct. At the terminal and western end of the ridge referred to on page 215, the exposure on the bluff above the level of the swamp may be taken as 50 feet high and the width, between the limestone on the south and the altered eruptive on the north, would be about 90 feet. Of this width about two-thirds, or 60 feet, would represent, as seen on the exposure and as far as it has been blasted into, solid magnetite ore of say 60 per cent. iron, which was noted as being very free from sulphides. The tunnel follows around this ore-body, keeping it on the left, and hence the amount of ore possible here would be the face, as described, multiplied by the thickness, at right angles to such face, as indicated by the tunnel workings. This body can be figured out with a reasonable assurance of its approximate correctness, and may be put down as "probable ore" or "possible ore." The figures given above for the face, 50 or 60 feet, multiplied by the thickness of about 70 feet, would give 210,000 cubic feet of ore, which, at 7 cubic feet to the ton, would represent 30,000 tons of ore. This amount may be taken as "probable ore" in this bluff exposure above the tunnel or swamp level. This ore could be mined at a low cost, and could be shipped cheaply by the projected tramway and pier.



SHOWING CONTACT OF MAGNETITE WITH LIME—TEXADA MINE.

OPEN QUARRY FACE, TEXADA IRON MINE.

As to the exposures along the brow of the ridge, extending back, as indicated by Mr. Carmichael, for 1,000 feet to the eastward, the development work, consisting of level open cuts and strippings, show ore for an exposed width of from 40 to 50 feet. Assuming that this 1,000 feet of outcroppings indicates a continuous ore body, the present development, cuts and shafts would indicate here present some 25,000 tons of ore, which, not being quite as free from rock as that in the bluff, would run about 50 % metallic iron. This ore could be won by surface mining at a small cost per ton, and its transportation effected by the production of the production of the tramway for such distance. It is quite probable that in the working of these visible deposits further extensions of the ore body may be discovered.

Texada Island.

In November the Provincial Mineralogist visited the iron properties on Texada Island. The geology of Texada island is practically the same as that of Vancouver Island, as already outlined in this report. The iron deposits which occur on the south-western slope of the island, 3 to 4 miles north of Gillies bay, have been known for years. At this point an arm of the granite, in evidence on the east coast, cuts across the island and at or near the junction of this granite with the rocks of the Vancouver series the iron ore occurs. These ore deposits all occur within the space of about one mile along the side and base of the first main range of hills which rises above the terrace forming the shore line. From a geological point of view, however, these deposits are undoubtedly of the same origin and, although they now present the appearance of separate and distinct ore bodies and have been located as separate mines, it is quite possible they may have been connected at one time.

Some areas were taken up for iron mining in 1875, at which time the holder of the land also acquired the base metals. Of these areas, some 400 acres are held by the Puget Sound Iron Co., of San Francisco, whose locations cover most of the important iron deposits of this locality, and on these only has any development been done. These iron ore properties, within the last couple of years, have been held by the Pacific Steel Co., under bond from the Puget Sound Iron Co., but it is reported by Mr. W. H. Lee, the representative of the Puget Sound Iron Co., that such bond has now been cancelled, owing to the non-fulfilment of certain financial conditions of the bond, that the property is again in the hands of his company unincumbered, and that the ore is now being mined by the Pacific Steel Co., merely on a royalty basis, which is stated to be 40 cents per ton, 50 per cent. ore.

Texada Mine.

The principal ore deposit, or at least that which has received the most attention and development, is situated about a quarter of a mile directly inland from the present wharf, and from 450 to 500 feet above sea level. The land rises from the sea by a series of benches, the first at an elevation of 250 feet, the second 450. Some 250 feet vertically up the hillside from the second bench there is a bluff point or knoll, on which occurs a very extensive magnetite exposure. Exposures of the same kind, though smaller, show above on the steep faces of a couple of similar terraces, at higher elevations, while indications of iron, still undeveloped, are found for a considerable distance further.

The principal workings, large quarries in the face of the bluff, are about 600 feet above the sea, and are connected with the shipping point by a surface gravity tram, with bunkers at the top and bottom. From the upper bunkers a level horse-tram runs a short distance to the east around the flank of the hill to a point just below the present quarries. The working face of this quarry is from 250 to 300 feet long, with a face of from 100 to 125 feet of ore, which is a clear magnetite mixed with rock, apparently altered diorite, now chiefly epidote. As the ore is mined on royalty, only that running 50 per cent iron, or over, is shipped. With such

sorting, only about half of the ore mined is shipped, the other half going on to the second class or waste dump. Some 6,000 tons of 50 per cent. ore had been mined from the quarry in 1902, by a force of 7 white men and 14 Chinese. The ore went to the Irondale furnace, and contained so much sulphur that it was roasted before smelting.

On the second terrace, and some 150 feet below the quarry, a vertical shaft had been sunk for some 150 feet, from the bottom of which a drift is reported as having been run into the hill under the quarry for 250 feet. This shaft was partly filled with water and could not be examined, but it is reported by Mr. W. H. Lee, the local manager, as having "cut through a 13-foot dyke of felsite, after which it was in magnetite as far as the face, or for 108 feet."

At the time the property was visited (November, 1902) a survey had been made and work was expected to be begun at once for the driving of an adit level, which, when completed, will be practically a continuation of the drift to the surface. Upon the completion of this latter, the drift will be pushed ahead for further development work. As far as can be learned, the following shipments have been made from this mine:—

Prior to 1884 shipments were made, but the amount of such cannot be learned.

Between 1884 and 1888 some		5,500	tons	were shipped.
In	1899 some	1,600	"	"
"	1901 "	2,500	"	"
"	1902 "	6,290	"	"
		15,890		

These figures would probably be increased to 20,000 tons if previous shipments were accounted for.

Of this ore deposit, Dr. George M. Dawson says in his Report for 1886 of Geological Survey of Canada, page 37B:—

"This appears to me to be neither a bed nor a true vein, but a contact-deposit which has been produced at or near the junction of the granitic mass with the stratified rocks, and more particularly with the limestone. Near the head of the slope, where the ore has been worked, the granitic rocks are replaced by gray crystalline limestone, which occasionally becomes a nearly white marble, and at this contact the large bodies of ore are found, and appear to occupy irregular 'chimneys' or interspaces of very variable dimensions. The ore penetrates, to some extent, not only the granitic rocks, but also the altered volcanic rocks and the limestone. It frequently includes large or small epidotic kernels, together with detached fragments of the volcanic rocks, and, in some places, reticulated veins of ore are seen in the granite forming a species of ore-breccia. The appearances are such as to indicate that the formation of the deposit occurred contemporaneously with the intrusion of the granitic mass, and has been dependent on the effects produced by that intrusion. Specimens of mixed ore and limestone, which may be collected, closely simulate interbedding, but the appearances developed since work has been carried on are such as, in my opinion, prove that the ore cannot be considered a bedded deposit. The first ore exposure mentioned by Mr. Richardson is probably one which has been cut through on the slope, between the wharf and its head. This is 30 feet or more in thickness, but is of inferior quality, and contains a considerable proportion of iron pyrites. The second exposure described is doubtless that at the head of the second slope. Portions of the ore in the actual workings are also found to contain more or less pyrites, and these are at present rejected as unfit for shipment. Traces of copper are also not infrequently seen on weathered jointage-planes in the mass of the iron ore. The quality of the greater part of the ore is excellent. A partial analysis by Dr. Harrington, in the laboratory of the Survey, showed 68.40 % of iron, with only .003 % of phosphorus. In Volume XV. (Mining

Industries) of the Tenth Census of the United States, p. 580, a partial analysis by Whitfield is given as a sample of this ore, selected as representing a lot of 600 tons at the Puget Sound Iron Company's furnaces. This shows: iron, 65.71; phosphorus, .013. A more detailed analysis, carried out by Messrs. P. C. Gilchrist and E. Riley, of specimens sent to the Colonial and Indian Exhibition in 1886, and published by these gentlemen in the Journal of the Iron and Steel Institute, 1886, p. 561, gave the following result:—Iron, 69.85; manganese, trace; siliceous matter, 2.75; sulphur, .06; phosphoric acid, trace; moisture, trace."

Paxton Mine.

A bench or terrace about 450 feet higher than the sea level extends along the base of the range of hills forming the ridge of the island, and along this base the several iron showings occur, the *Paxton* being one of the most promising. This bench, although having a general slope towards the sea, is in parts swampy and covered by a heavy surface deposit of soil with forest vegetation. These surface deposits extend to the base of the ore-bearing rocks and in many cases underlie the ore, but as no attempt has been made to prove the ore-bodies below such swamp level, only those which are above this level are known. The bench referred to extends nearly to Gillies bay, some three miles distant, and would form an easy location for a railway, which could be run to tap all the known iron ore deposits, while at Gillies bay there are good facilities for docks, etc., which would be well sheltered and available at all seasons of the year. The *Paxton* mine is on the crescent-shaped end of a knoll or ridge rising out of this swampy bench, and the surface exposure of magnetite extends along the face and brow of this ridge for some 500 feet, the ore, of more or less purity, covering the surface for this distance and having a superficial width of from 250 to 300 feet. The height of the bluff above the swamp is about 80 feet, and at one point a couple of large open cuts have been run in near the base, starting some 50 feet apart, but converging together as they proceed. These cuts have been run in level for some 40 to 50 feet, but when inspected the first 30 feet only were visible, the inner ends being filled with ore broken from the face of the bluff above and, consequently, they could not be examined for the full distance. A dyke or ridge of bleached granite some 20 feet wide rises from the swamp level at the base of the ore deposit to a height of 10 or 12 feet, dipping into the hill at an angle of about 80°. The cuts pass through this granite, which has the appearance of a foot-wall, directly into solid ore, and are said to have continued in such ore to the face, but on account of the broken ore from the face, only 10 to 15 feet of the level cut inside of the granite were visible, at which point the ore pile slopes up at an angle of 45° to an almost perpendicular face of solid magnetite, which, as previously stated, extends to 80 feet above swamp level. The ore-body has not been cut through, so that it is impossible to say just what thickness it may prove to have. Back of the ore exposure the country rock is a greenish altered eruptive, while some 200 yards further to the north limestone is seen on the surface. The work done shows the ore at this point to be 30 to 40 feet thick, at least, the ore-body not having been cut through. This is, of course, a very slight thickness proved for a surface showing 250 to 300 feet wide. The width of the cuts, some 30 to 40 feet, is all that has been proved of the total length of 500 feet, through which the ore is traced on the surface.

While it is, therefore, impossible from the present development to figure "*ore in sight*" which would in any way do justice to the importance of the deposit, still it may be hazarded as an estimate that some 200,000 tons of ore, at least, may be expected from here. As to the quality of the ore, it is fairly solid magnetite for the most part, with a certain amount of quartzose material through it, and would probably run, as mined, over 50 % iron.

In the cut and on the face of the bluff where the ore has been blasted and allowed to stand for some years, there is a noticeable whitish coating of sulphate of iron. A very considerable percentage of iron sulphides is present, more particularly in the lower part of the workings,

while on the upper part of the bluff very little sulphide is visible, but this may have been removed by weathering. No ore has ever been shipped from this mine, but there is now a considerable pile on the dump.

Of this claim Mr. Kimball, in the paper already referred to, says:—The Paxton ore-body is a replacement of limestone, apparently complete, at the base of the same slope about a mile inland, rising to a height of about 70 feet above the level of the swamp by which the nether portion is concealed, and the elevation of which is about 468 feet. The longitudinal axis of the lens is about 250 feet, and the thickness of its upper face about 30 feet. Probably less than half of the original lens has been preserved from erosion. It lies in a lap of epidotic diorite, the replaced limestone having been entirely surrounded by eruptive material, contiguous portions of which have undergone alterations."

The *Lake* mine, belonging to the same Company, is situated on the same bench as mentioned in the preceding property, but about half a mile to the east. This body of magnetite has not been prospected in any way, and is, in consequence, only a surface exposure on a knoll, with gradually sloping sides rising above the swamp level for some 80 feet, and which, on the surface, appears to be composed of solid magnetite. To the north-west lies a band of crystalline limestone, and to the south-east diorite, while some limestone was noted in the upper face of the knoll, but could not be traced. The width of the exposure is about 300 feet north and south, and the length about the same. The surface of the knoll is composed of blocks of magnetite, disconnected, but apparently in place. The ore-body is very similar to that at the Paxton, and probably of approximately the same size, while the quality of the ore is the same on the surface, although as nothing but the weathered exterior of the deposit could be seen, no idea could be formed as to its sulphur contents. Of the *Lake* mine, Kimball says:—"The height of the ore mass as preserved is accordingly about 78 feet; its length about 200 feet, and its maximum thickness about 50 feet."

ANALYSES OF IRON ORES ON THE COAST OF BRITISH COLUMBIA.

Locality.	Kind of Ore.	Iron.	Silica.	Sulphur.	Phosphorus.	Titanium.	Copper.	Lime.	Manganese Oxide.	Alumina.	Analyst.
Quatsino Sound	Bog iron	52.0			0.5						Provincial Gov't. Laboratory.
"Glengarry," Nootka, hand sample	Magnetite	69.0									" "
"Violet," Hesquiot, average sample	"	59.8	11	0.55			0				" "
Lowest outcrop Agnes 2, Hesquiot	"	44.7					0				" "
" 75 feet above first outcrop	"	56.7	13.1				0				" "
Crown Prince, Seshart, average sample	"	48.4		0.7	Trace.	Trace.	0				" "
" " hand "	"	66.0	2.	.02	.01			4	.44		E. H. Cook, Middleborough, Eng.
" " " "	"	65.00		.09	.008						Dr. O. Wuth, Pittsburg, P., U.S.A
" " glassy ore	"	37.4									Provincial Gov't. Laboratory.
Bald Eagle, Seshart, average	"	62.2									" "
"Mountain," Copper Island, average sample	"	50.4	18.6	0.3	0.053	Trace.	0				" "
Sarita dump, average	"	63.7	3.85	0.3	Trace.	None.	0				" "
Smith's Landing (139), rough average sample	"	55.9	16.0	1.0			0				" "
Brown's claim, Anderson Lake, average sample	"	55.7	20.3	0.3			0				" "
"Bently & McG.," Bugaboo Creek, Port Renfrew	"	69.2	2.7	0.5			0				" "
Baden Powell and Little Bobs, Bugaboo Creek, Renfrew, best looking surface ore	"	63.6		1.5							" "
"Rose," Newton, hand sample	"	61.9		0.34		Trace.					" "
"Ogenau," Tyee Co	"	69.7									" "
Sooke Iron Mine, 8 samples, mixed with a considerable amount of pyrites	"	28% to 64%					1				E. R. Kendrick.
Texada Iron Mine, hand sample	"	69.85	2.75	.6	Trace.						Geol. Surv., Canada.
" "	"	67.91	2.96		"			1.05			Fulmer, Geol. Sur., Wash.
" representing a lot of 600 tons smelted at the Puget Sound Iron Co.'s furnace	"	65.71			.013						Tenth Census, U. S.
Redonda Island Iron Mine	"	65.9	4.3	.015	None.			2.3	.11	.22	F. T. Wait.

Department of Mines, Victoria, B. C., February, 1903.

ALBERNI DISTRICT.

ALBERNI MINING DIVISION.

REPORT OF A. L. SMITH, GOLD COMMISSIONER.

I have the honour to submit my report of mining operations in the Alberni Mining Division for the year 1902. Notwithstanding a certain depression in mining in this vicinity during the past year, there has been a considerable amount of assessment work carried on with very satisfactory results, and more certificates of improvements issued than in any previous year.

On the *Golden Eagle* development work was carried on during the greater part of the year with a force of from 15 to 20 men, but with what results the management will not state.

On the *Monitor*, owned by the Monitor Mining Company, development has been carried on upon a fine body of ore about 25 feet from the old workings. The showing is from 6 to 7 feet wide, of chalcopyrite.

On the *Happy John Group*, owned by A. J. Engvick, *et al.*, the ore has been proved at a depth of 300 feet below the old workings, showing a high-grade chalcopyrite. The vein is traceable by different outcrops throughout the property for a distance of about 3,000 feet.

On the *Southern Cross Group*, owned by E. E. Leason, *et al.*, and situated on Uchucklesit harbour, an excellent showing of chalcopyrite 18 feet wide has been exposed. This is very favourably situated for shipping, being about 100 feet from tidal water. The vein can be traced through the length of two claims.

On the *Belvidere* and *Sunshine Groups*, situated near Uchucklesit harbour, and owned by L. Manson, *et al.*, assessment work was performed with very satisfactory results.

On the *Black Warrior Group*, situated on Phantom mountain, Alberni canal, and owned by A. Watson, *et al.*, a tunnel has been driven about 60 feet on the main lead, which is about two feet in width and traceable by open cuts for a distance of about 800 feet. Average assays give from $2 to $12 gold, $3 silver, and 15 % copper. The natural route to these claims is by Coleman creek valley.

* Iron.

On the *Defiance Group*, owned by J. Monie and M. Comerford, and situated on the west side of Alberni canal, about 1¼ miles from tidal water, at an elevation of 900 feet, there are outcrops of magnetite, an average sample of which assayed 63 % metallic iron. One outcrop has been traced for 350 feet in a direct line, varying in width from 3 to 10 feet. The iron shows from the surface downward, where it is cut by an old creek to a depth of 12 feet, and has every indication of greater depth. Another outcrop appears to be about 30 feet wide and 50 feet in length. A considerable amount of stripping has been done, but these claims have not yet been sufficiently prospected to show the thickness of ore.

On the *Darby and Joan Group*, situated at Smith's Landing, Alberni canal, and owned by John King, *et al.*, a considerable amount of work was performed.

* *See* Report on Iron Ores of the Coast, pp. 201-229.

The Pacific Steel Company has continued development work on the Copper Island and Sarita iron properties.

On the *Linnet Group*, situated near Uehucklesit harbour, and owned by James Wilkinson, an outcrop about 40 feet wide, traceable for some 300 feet, has been discovered.

OFFICE STATISTICS—ALBERNI MINING DIVISION.

Free miners' certificates issued	88
Mineral claims recorded	64
Certificates of work issued	124
Certificates of improvements issued	21
Bills of sale, bonds, etc., recorded	45

Revenue.

Free miners' certificates	$ 452 25
Mining receipts, general	1,380 40
Mineral tax	150 04
	$1,982 69

*CLAYOQUOT MINING DIVISION.

REPORT OF W. T. DAWLEY, MINING RECORDER.

I have the honour to submit my report of mining operations in the Clayoquot Mining Division during the year 1902.

By an Order in Council dated October, 1902, the West Coast Vancouver Island Mining Division was divided into the Clayoquot and Quatsino Mining Divisions. The following is the official description of the new Clayoquot Division:—

"Commencing at Amphitrite point; thence northerly, along height of land separating drainage area of those streams emptying into Pacific ocean north of such point from drainage area of those streams emptying into Barkley sound, following such height of land to a point where it intersects the height of land separating drainage area of those streams emptying into Pacific ocean on west from drainage area of streams emptying into Straits of Georgia on east; thence north-westerly along such divide to a point west of Conuma (or Woss) lake; thence south-westerly, on the height of land separating the streams draining into Kyuquot sound on the north from those draining into Esperanza inlet on the south, to Tatchu point; thence by Pacific ocean, including all Coast islands, to point of commencement."

Mining operations during 1902 have not been as bright as they were in previous years, the only actual development work having been done at Quatsino sound, on the Yreka Copper Co.'s claims in the part of the Division now included in the Quatsino Mining Division.

In August last, Messrs. Frank and Hicks recorded some 13 claims in the Quatsino District for themselves and Mr. Henry Croft, of Victoria, but, so far, have done no work on them.

ELK RIVER AND KENNEDY LAKE.

Rose Marie.

Work has been carried on steadily throughout the year on the *Rose Marie Group*, owned by the Boseco Mines, Ltd., of Vancouver. The claims, 8 in number, are named respectively *Rose Marie No. 1* to *No. 8* and the

* Formerly, with the Quatsino Mining Division, known as the West Coast Vancouver Island Mining Division.

ore is a free-milling quartz. The values in gold are holding well, and the leads are widening with depth. It is rumoured that in the spring the Company will put on a larger force of men and use the stamp-mill which was erected on the property some years ago by the previous owners. Owing to litigation, work on this property had been at a standstill for some time.

The *Grizzly Bear* and *Cinnamon Bear* were located last July by Messrs. Spittall and Sundvall, of Clayoquot, who transferred an interest to Capt. John Irving, of Victoria. These claims have a continuous lead of gold-bearing quartz and the values are being well maintained as development proceeds. About 8 men are now working on these properties.

From the *Leora* claim, owned by Messrs. Kenyon, Grant and Russell, also on Elk river, 10 tons of quartz were shipped, in September last, to the Crofton smelter and gave a return of a little over $40 to the ton.

Mr. T. G. Norgar owns some very promising claims in this District, and on the *Edith Group* of 3 claims, owned by Mr. Lachlan Grant, of Clayoquot, there are good showings of free-milling quartz.

At Ahousat fine showings of iron and copper ore are to be found on Matilda creek, a number of claims in this section being owned by Messrs. Watson, Sullivan and Ringland, by Messrs. Gardhouse and Beck, and by Messrs. Irving, Dawley and Poole. The annual assessment work has been performed on all these properties.

At Nootka large exposures of iron ore have been located and recorded on the Tahsis arm and at Head bay, Nootka sound. The claims are owned by Messrs. Hauger and Netherby, and Dawley, Grant and Poole. As these are practically new locations, little work has been done upon them outside the required assessment work.

Bear River.

This District has received a good deal of attention. The *Seattle Group* of claims has had a considerable amount of labour and money expended on it, work having been again resumed upon these properties after the lapse of considerable time. The group is owned by The British Pacific Gold Property Co., of Victoria.

In September last an ore-body, which is reported to be of very considerable extent, was located at the head of Bear river by Messrs. Drinkwater and Nichols, who have been prospecting in the vicinity for a number of years. The nature of the ore has not yet been determined, and owing to the lateness of the season the locators have only been able to cut a rough trail through, being prevented by the early heavy fall of snow this autumn from doing any work. As soon as the snow melts a thorough examination will be made.

On the *Belvide* and *Corona Group*, owned by Messrs. Waterhouse, Hovelaque and Von Brendel, of Alberni, assessment work has been steadily carried on for the last five years.

At Sydney inlet, Dr. T. R. Marshall has been carrying on development on the *Prince Nos. 1, 2, 3, 4, 5, 6, 7* and *8* claims nearly the whole year. The ore is a high-grade copper, but I understand from Dr. Marshall that he has now closed down work until he can get machinery installed. These properties are all Crown-granted.

The *Indian Chief Group* of five claims, on Sydney inlet, is owned by the Dewdney Canadian Syndicate. Work has been done from time to time during the year and a couple of hundred tons of ore are on the dump ready for shipment.

Messrs. J. W. Jones and J. McInnis are locators of the *Mountain Lion* and *Sahara* claims, which adjoin the *Indian Chief Group*.

At Deer creek, the *Hettie Green Group*, owned by Messrs. Thomson and Ward, of Alberni, has had extensive work done on it. The ore is yellow copper.

Among promising claims in this vicinity may be mentioned the *Jumbo* and *Crow*.

The property on Trout river owned by the Helga Gold and Copper Company, and named the *Good Hope Group*, is being worked by about eight men, tunnelling and other development work being in progress.

Among the properties on Disappointment inlet worthy of note is the *Kalappa* mineral claim, owned by Messrs. Chesterman, Jacobson and Jensen. This is a gold and copper proposition and it was worked for a few months during the year, tunnels of considerable length being run.

At Hesquoit the *Brown Jug* claim, owned by Messrs. Norris and Smith, of Alberni, and the *Thelma Group*, the property of Messrs. F. Jacobsen, *et al.*, have had their annual assessment work performed on them.

At Wreck bay, during 1902, very little work was done on the black sand beach claims. The Ucluelet Placer Mining Company had about 9 men working during the spring for about six weeks, engaged in building flumes, etc., but little or no sand was sluiced, and only abont $100 worth of gold was taken out for the whole season. The cause of so little having been done is that Mr. Sutton, who had contracted to work the different leases some two years ago, has now completed his contract.

Most of the claims mentioned in this report are near salt water and easily reached.

OFFICE STATISTICS.

Free miners' certificates issued	62
Mineral claims recorded	149
Certificates of work recorded	96
Bills of sale, bonds, etc., recorded	55
Certificates of improvements issued	9
Payments in lieu of work	2

REVENUE.

Free miners' certificates	$ 301 75
Mining receipts, general	993 95
	$1,295 70

QUATSINO MINING DIVISION.

REPORT OF E. E. POTTS, MINING RECORDER.

I have the honour to submit my first annual report on the Quatsino Mining Division for the year ending Dec. 31, 1902.

By an Order in Council dated October, 1902, the West Coast (V. I.) Mining Division was divided, the northern portion being formed into the Quatsino Mining Division, with head office at Quatsino. The boundaries of the new division are as follows:

"Commencing at Tatchu point: thence north-easterly, on the height of land separating the streams draining into Kyoquot sound, on the north, from those draining into Esperanza inlet on the south, to a point west of Conuma (or Wors) lake; thence north-westerly, on the height of land separating the drainage area of those streams emptying into the Pacific ocean, on the west, from the drainage area of those streams emptying into the Straits of Georgia, on the north-east, to Cape Scott; thence by Pacific ocean, including all coast islands, to point of commencement."

The most important development work done has been by the Yreka Copper Company on the *Comstock*, one of the claims held by it, consisting of open quarry work and three tunnels, all of which disclose considerable bodies of copper sulphide, carrying gold and silver values. Besides the development of the mine property, the Yreka Company has built the finest wharf on the West Coast; the largest and most up-to-date ore bunkers, capacity 2,500 tons; an aerial tramway of 3,600 feet, on the Riblet system, and two baby trams of 800 and 400 feet, respectively, for transferring ore from the mines to the main bunkers, and a substantial trestle for running the ore from the bunkers to the ship. Two trial shipments were made of about 100 tons each, the results being most satisfactory.

The next most important development work in this Division has been done by the Copper Mountain Mining and Development Company on the *June Group* of 5 claims, located on the east side of the south-east arm, 5 miles inland. The work done consists of open quarry work on a large outcrop of copper sulphide ore, carrying high values in gold and silver. This company has been expending considerable money on a first-class trail, which is about two-thirds completed and which, when finished, will open up a highly mineralised country, extending as far as Marble creek, which flows into Quatsino narrows.

The Edison Mining Company, the property of which adjoins the *Superior* mineral claim, owned by the Yreka Copper Company, has done sufficient work to show that further development is warranted.

The *West Group*, owned by Messrs. Clarke, Gwin and Lee, has had considerable work done on it with most satisfactory results. This property adjoins the Yreka Company's claim, *Climax*, on the west.

The *Blue Grouse* claims, adjoining the Yreka Company's on the south-east, have also been extensively prospected, with results sufficiently satisfactory to warrant a further outlay of capital for opening up the property.

Several claims on Teeta river are looking well and considerable prospecting has been done on them, the ore being similar to that mined by the Yreka Company.

On the West arm large bodies of iron have been located, which will doubtless be further developed this year.

On Malatta river several claims have been recorded, with quite a showing of work, and these two will be further developed this coming year.

OFFICE STATISTICS—QUATSINO MINING DIVISION.

Free miners' certificates	2
Claims recorded	19
Transfers recorded	3
Filing notice to group	1
Applications for certificates of work	10

NANAIMO DISTRICT.

NANAIMO MINING DIVISION.

Report of Marshal Bray, Gold Commissioner.

I have the honour to submit my annual report on the mining operations in the Nanaimo Mining Division for the year ending the 31st of December, 1902.

There were 560 mineral claims in good standing at the end of the year, and while fewer locations were recorded than in previous years, considerable development work has been done in various sections of the Division, giving, in many instances, very good results. The mineral veins appear to be true and permanent, and the values, as far as known, have always improved with depth. The ore-bodies are large, the climate is favourable for operations all the year, and the sea is everywhere so near as to make the cost of transportation of machinery and materials comparatively small. The mineralised area is extensive, timber is plentiful, and in many places water-power is available, so that the promise of profitable returns for intelligent investments is far greater than in many other localities.

Texada Island.

Marble Bay.

The *Marble Bay* mine has shipped about 6,370 tons of copper ore during the year, and has added 3,500 tons of ore to the dump. The development work for the year consists of sinking the shaft 100 feet, and 175 feet of drifting and cross-cuts. The lowest level is now 360 feet below the surface. The average number of white men employed for the year was 44, and the average number of Chinese employed for the year was 12. Substantial ore-bunkers have been erected on Sturt bay, connected with the mine by a tram road 2,125 feet long, which is now in operation. It is very encouraging to note that the per cent. of copper in the ore has been maintained with the depth, while the gold values have increased to an appreciable extent. A new lime kiln has been erected on the property at the north end of the island, owned by the Marble Bay Co., and the output is finding a ready market in the Hawaiian Islands, notwithstanding a duty of 10 cents per barrel imposed by the American Government on lime imported from British Columbia.

Van Anda.

The properties held by the Van Anda Copper & Gold Mines Co. have passed under the control of an English syndicate, and are being thoroughly exploited. In the *Cornell* mine the main shaft has been sunk to the 360-foot station and levels have been set off. The main shaft is now being sunk to the 460-foot station, the intention being to open the *Cornell* mine to the 560-foot station before any stoping is attempted. A new ore-body has been opened up about 30 feet below the 160-foot level, and gives promise of a large amount of profitable ore. On the 160-foot level the drift has been carried about 200 feet eastward to open up the "Glory Hole" ore-body, where some highly profitable ore has been encountered. On the 80-foot level a drift has been run to the south to open up a new ore-body uncovered on the surface and carrying high gold values.

Work has been commenced on a tram-line to connect the *Cornell* and *Copper Queen* properties with the smelter. The present operators have confined themselves to straight development work, and this policy will be continued for about 4 or 5 months yet.

The *Royal Flush* claim is situate about 3 miles north of Van Anda, and the company has done the following work during the year, namely: 62 feet of shaft, 79 feet of drifts, and 15 feet of raising. About 70 tons of high-grade ore, running 17 per cent. copper and 20 oz. in silver, have been taken out and are ready for shipment. Besides this, a large quantity of second-grade ore has been taken out of the claim.

The Puget Sound Iron Company's mines have only been worked for the iron ore during the year, and they have shipped 6,290 tons to Irondale, employing a force of 10 men.

The Texada Gold Mines Co. has done very little development work during the year, but it is reported that it is about to resume operations and erect a new plant.

A number of other properties on Texada island have done considerable development work during 1902, with very good results, and the prospects for the coming year are encouraging.

From the *Blue Bell* claims, situate on Frederick Arm, a trial shipment of 15 tons of ore was sent to Tacoma, giving $13.50 in gold and silver per ton. A gravity tram is now nearly completed to this mine, and a large body of ore has been exposed, which it is intended to work by quarrying this winter and ship to the Crofton smelter to be treated. The number of men employed is 14. On the other claims in this vicinity only the necessary assessment work has been done.

On the *Young Australian* claim, on Phillips arm, considerable tunnelling has been done during the year, and it is intended to make a trial shipment this winter. The ore taken from the tunnel gives very good assays.

On the *Ajax Group*, on Valdes island, about 150 feet of drifts have been run and two shafts sunk during the year. This work has exposed a considerable quantity of ore and about 30 tons have been taken out, assaying over 25 per cent. in copper and $6 in gold and silver. Work on these properties was discontinued last fall, owing to the extreme wetness of the shafts.

Considerable work was done on Thurlow island during the year, with very encouraging results, and development work has also been carried on at Toba, Bute, Loughborough and Knight's inlets, with gratifying results.

The *Kla-anch Group* of claims, on the Kla-anch river, have been steadily developed during the year, and a large body of iron ore is said to have been opened up.

The *Delphi Group* of seven mineral claims, in Dunsmuir District, is owned by the Nanaimo Jubilee Mining and Development Company, Ltd. A shaft, 60 feet deep, has been sunk on these properties during the year and has struck a body of ore carrying 15 per cent. copper and good values in gold and silver. This Company also owns the *Green Mountain Group* of eight mineral claims. The latter property has been opened up by tunnels and cross-cuts and large ore-bodies have been uncovered, which assay in gold and silver values from $2 to over $30 per ton. These two groups of claims are about 18 miles from the line of the E. & N. Railway, and when they are equipped with modern plants should become large producers.

Considerable prospecting and locating was done in this District during the past year, and no doubt during the coming summer many locations will be made.

Quite a number of locations were made in Bright and Oyster Districts during the year and some of them are making favourable showings.

The mineral claims located and recorded during the year ending the 31st of December, 1902, are situate in the following places throughout the Nanaimo Mining Division, viz.:—

Texada Island	62	claims were	recorded.
Redonda Island	2	"	"
Valdes Island	6	"	"
Channe Island	2	"	"
Thurlow Island	6	"	"
Pearse and Nigie Islands	4	"	"
Phillips Arm	19	"	"
Frederick Arm	1	"	"
Fanny Bay	2	"	"
Malaspina Peninsula	1	"	"
Toba Inlet	3	"	"
Loughborough Inlet	4	"	"
Tatlyoco Lake	6	"	"
Powell Lake	2	"	"
Horne Lake	2	"	"
Kla-anch River	1	"	"
Discovery Passage	1	"	"
Wells Pass	1	"	"
Dunsmuir District	22	"	"
Oyster District	7	"	"
Bright District	24	"	"
Comox District	1	"	"
Total of	179	"	"

Office Statistics—Nanaimo Mining Division.

Individual free miners' certificates issued	291
Companies " " "	7
Mineral claims recorded	179
Certificates of work recorded	226
Paid in lieu of work	2
Certificates of improvements recorded	18
Crown grants applied for and issued	18
Bills of sale recorded	50
Abandonment recorded	1
Permission given to re-locate	11

The revenue collected for the above free miners' certificates and mining receipts generally, for the year ending the 31st of December, 1902, was $4,234.15.

VICTORIA DISTRICT.

VICTORIA MINING DIVISION.

Mount Sicker Camp.

The Provincial Mineralogist visited the Mount Sicker camp on November 4th, 1902, but, as the next morning the ground was covered with a heavy fall of snow, very little could be seen of the surface exposures, the examination practically being confined to the workings underground.

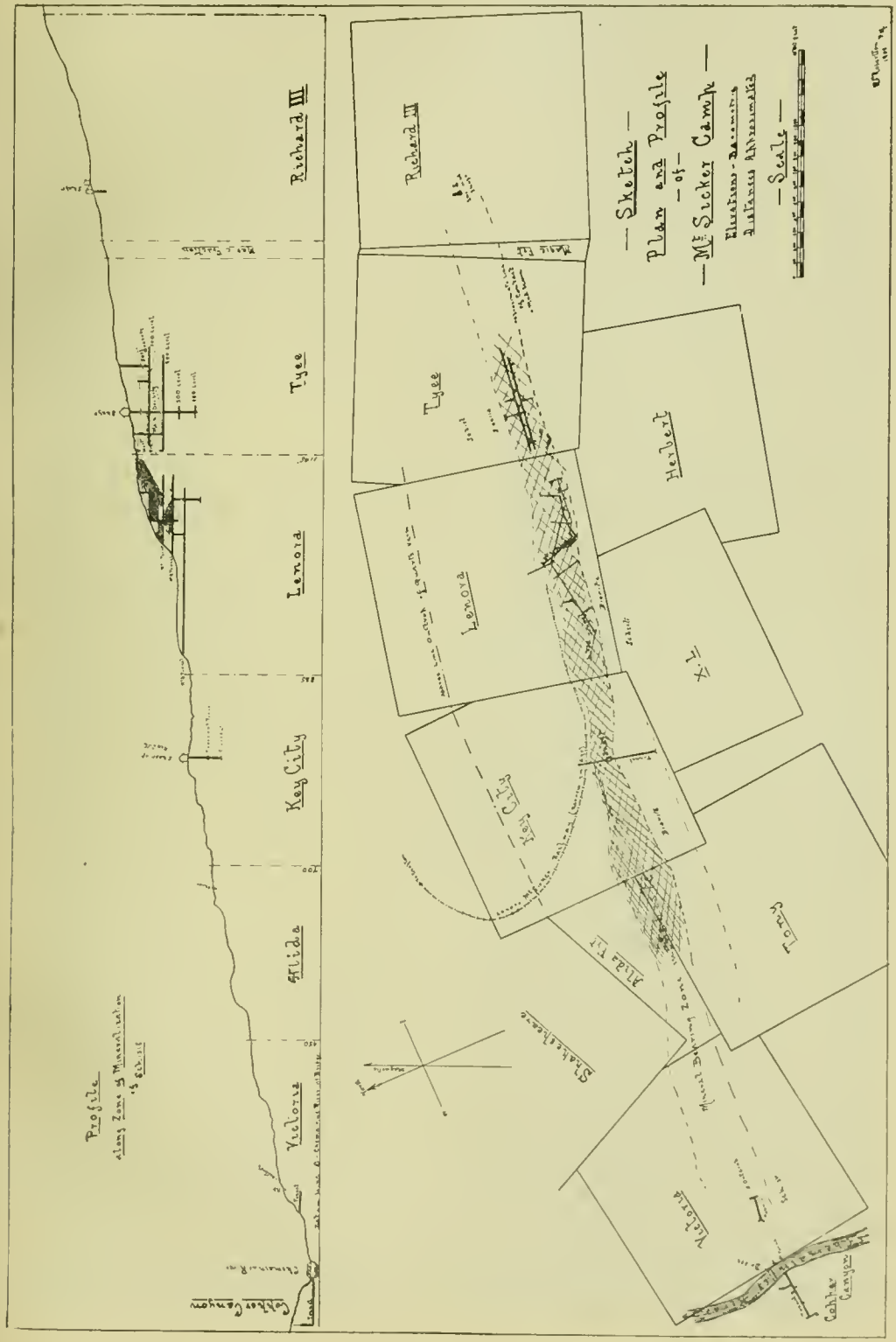
Mt. Sicker camp is situated in the valley of the Chemainus river, and includes the western slope of Mount Sicker and the eastern slope of Mount Brenton. The town and the greater part of the mine workings are on the Mount Sicker slope, about 1,200 feet above the river, and are reached by waggon road either from Westholme or from Somenos stations, on the E. & N. Railway, distances respectively of 6 to 4 miles, while a narrow-gauge ore-railroad runs from the *Lenora* mine, crosses the E. & N. line at "Mount Sicker Crossing," and continues over the Mount Richards range of hills to Crofton, on the east coast of Vancouver Island, where the Northwest Smelting and Refining Co. has recently erected a smelting plant. Daily stages also run to Mount Sicker from Duncan's station, a distance of 11 miles, and this is the easiest method of reaching the camp.

The camp has become well known as including the *Lenora* and *Tyee* mines, both of which are situated on the Mount Sicker slope. The former property has already shipped a very considerable tonnage of copper-gold ore, and the latter, after a good deal of development and some trial shipments, is now about to begin a regular output of ore of the same class.

The mineral in this camp, so far as has been developed, is found to be in a band of chloritic schist of at least 1,000 to 1,500 feet in width, which outcrops on Mount Sicker at an elevation above the Chemainus river of about 2,500 feet, and may by traced in a S. 70° W. direction, crossing the Chemainus river at the bridge and in all probability continuing on over Mount Brenton, as the range of hills on the west side of the river is called.

Following the general trend and bedding of these schists, a diorite dyke, of considerable strength and remarkable regularity and persistence, has forced its way and may be traced on the surface, continuous as the schists, from the *Richard III.* through the *Tyee*, *Lenora*, *Key City*, *Tony*, *Alida Fraction* and *Victoria* claims, thence crossing the river into the *Copper Canyon* and *Susie* properties. This may be designated the "Lenora dyke," as it was on that property that it was first developed. Other dykes of similar character seem to run in parallel courses, the schists hereabout appearing to be included in the great igneous upheaval.

The line of contact of the dyke and the schists seems to have been one of very considerable and extended geological movement, as evidenced by heavy gouge or clay seams, and, as found in the workings of the developed mines, closely associated with this clay gouge there is a band of black graphite schist or shale, which, while not in itself mineralised, seems to be associated with the mineralisation and serves in the mines as an indicator of the ore zone. The movement referred to probably took place after the formation of the dyke in question and


— Sketch —
Plan and Profile
— of —
— Mt Sticker Camp —
— Scale —
Richard III
Tyee
Lenora
Key City
Ethlide
Yukoria
Profile
Richard III
Tyee
Herbert
Lenora
Key City
Ethlide
Yukoria
Mount
Cohlar Canyon

was accompanied by the foliation of the schists, particularly on the higher elevations, rendering them readily permeable to mineral-bearing solutions.

This foliated band of the schists may safely be said to extend from the summit of Mount Sicker to the summit of Mount Brenton, and probably may be traced farther in each direction, the schists being more open, or "looser," as an elevation above the river is gained.

On the *Lenora* and *Tyee* properties these foliations have been such as to admit of the formation of a series of large lenses of ore, up to 300 or 400 feet in length and 100 feet in depth, with a maximum width of from 30 to 40 feet. These lenses have been proved by the workings on these two claims to extend practically in continuous succession from the original tunnel of the *Lenora* eastward into the *Tyee* ground, a total distance of from 1,300 to 1,400 feet, while in the latter property the most easterly workings still show good ore in the face, proving that this distance, considerable as it is, must not be taken as the final length of the productive mineralisation, and although it is not safe to speak of more than has been actually proven to exist, the indications point to the probable extension of the ore zone considerably farther to the east, probably into the *Richard III.* ground.

While there are some minor differences in the occurrence of the ore in these two properties, the *Lenora* and *Tyee*, they are practically the same deposit, and it is a matter of regret, for the sake of economical mining and treatment of the ore, that they should not be worked as a single mine, the development of the one serving as a development of the other. Partly on account of the topography of the ground, the greater exploratory development of the schist zone has been from the "discovery" on the *Lenora* eastward, and, although considerable work has been done to the westward, no ore of a similar character or of commercial value has as yet been encountered in this direction, a fact which is open to various explanations.

The workings on the *Key City* cross-cut the formation in the line of the *Tyee-Lenora* deposit, and immediately adjoining the latter property, but these have so far failed to prove any ore-body of like character. It is claimed, and with some evidence to back the supposition, that the mineralised zone at the elevation of the *Key City* has been deflected to the south or into the *N. L.* ground, on which last claim nothing more than surface work has as yet been done, and, consequently, until more development is performed here, it cannot be, so far, taken as proven that no ore does occur to the west of the *Lenora* workings. That such important mineralisation should end so abruptly seems unlikely, where the conditions favouring its deposit appear to continue.

It is a fact, however, as already noted, that the schists appear to be "looser" in the upper part of the Mt. Sicker slope, and that the ore lenses, so far as known or developed, are found on the two upper levels in both the *Lenora* and *Tyee* mines, while the development of these properties on the lower levels has, up to the present time, failed to discover any important body of ore. The ore in the *Lenora-Tyee* deposit is almost unique in its character, containing, as it does, from 25 to 30 % of barytes, as will be seen from the analyses elsewhere in this report, and such distinctive peculiarity might be expected in any extension of this ore-body.

On the *Victoria* and *Copper Canyon* claims mineralised lenses occur, but they are of smaller size than previously noted, showing, at the largest, only a width of 6 or 7 feet, the mineralisation being quartz with iron sulphides, or pyrrhotite with a small quantity of chalcopyrite, but lacking the barytes, which would indicate that the mineralisation near the river was not associated as to source with that of the upper part of the hill.

Richard III.

The *Richard III.* mineral claim lies to the eastward of the *Magic Fraction* of the *Tyee Group*, and on the production up the hill of the *Lenora-Tyee* band of schists. This was the most easterly claim examined or found

TYEE SMELTER, LADYSMITH GENERAL VIEW OF WORKS.

to be developed in the Mt. Sicker camp. The property is now held by the Richard III. Development Company, Limited, of Duncans, which company is at present preparing for the active developing of the ground. A shaft has been started on the edge of a small ravine or draw which seems to have cut its way along that portion of the schist most shattered by the movement previously noted. So far, no ore "in place" has been encountered, nor has any cross-cutting been done to find it. The finding of the fragmental ore in the gouge is encouraging, considering the position of the claim with relation to the producing properties below, and the formation of the country renders it probable that the ore-bodies of those claims may be found to extend into this property, although such still remains to be proved.

When visited (Nov. 7th, 1902), the shaft had just been re-timbered and the collar raised some 15 feet above the level of the ravine. A substantial gallows frame had been erected; a small portable boiler and hoist was in place, and a temporary shed was being put up over it; cabins were being built for the foreman and men, and by the close of the year regular work should be under way.

Tyee.

The Tyee Copper Co., Ltd., of London, England, is the owner of the *Tyee Group* of mines, including the following claims:—*Magic Fraction*, *Tyee*, *X. L.*, *N. T. Fraction*, *Tony*, *Herbert*, *Phil Fraction*, *Donald*, *Muriel*, *T. H. W. Fraction*. The Company's affairs in British Columbia are under the general management of Clermont Livingston, Esq., of Duncans, with Mr. Ed. M. Musgrave as manager of the mine on Mt. Sicker, and Mr. Thos. Kiddie manager of the smelter at Ladysmith. Almost all the work done on the Mt. Sicker properties has been concentrated on the *Tyee*, and on this claim only has any commercial body of ore as yet been developed. The *Tyee* claim adjoins the *Lenora*, lying higher up the slope of Mt. Sicker and on the same band of schists. The earlier development of the *Lenora* in 1897 and 1898 showed that the ore-bodies were running and dipping into *Tyee* ground, and this led to the serious development of the *Tyee* property, on which no other important surface exposures of the ore had been found. In 1898 a small shaft was sunk by the then Tyee Company at a distance of only a few feet from the *Lenora* boundary line, and on the extension of the same ore-body. It is understood that this shaft carried ore for some distance down, but lost it at the bottom. This was, however, regarded only as a prospecting shaft and was abandoned, and a second shaft was then sunk a few yards further up the hill. From this latter some rather irregular workings were set off, which, however, developed ore. The main shaft was started in 1899 (or 1900) 275 feet east of the *Lenora* line, and it has now been sunk to the 400-foot level (really 32 feet deeper, as the levels count from the collar of the second shaft). At the 100-foot level (132 feet down) a cross-cut was made to the south for 60 feet, where ore was struck and drifted on east 200 feet and west 150 feet, or a total length of 350 feet, which, until further development is done, may be taken as the length of the main ore-body. At the eastern end of this ore-body, where it cuts off in the drift, an upraise was made which was in ore for 50 feet above the level, when it ran into schist. This same ore-body was encountered in the shaft 90 feet below, but did not reach to the 200-foot level; it is found, however, in a drift off No. 2 shaft, to be some 10 or 15 feet above the 200-foot level for a distance of some 150 feet west of the main shaft. Cross-cutting has proved this ore-body to have a maximum width of 40 feet near the middle of its length, while widths of 25 and 30 feet have been shown between the middle of the respective ends.

Continuing east along the 200-foot level, from the point 200 feet from the main shaft where the main ore-body cuts off, the drift is in mineralised schists for about 60 feet, when the point of the east ore-lens is cut by the drift, which continues in ore for 160 feet, or to the end of the present drift, with good ore still in the face and with every indication that the lens is likely to extend eastward for some distance yet. At about 300 feet east from the main shaft,

or some 40 feet in on this east lens, an upraise had been about completed to the surface (200 feet vertical) which proves the lens to extend 25 to 30 feet above the level. Further than this the dimensions of this ore-body have not been definitely determined, but are rather inferred from the shape of the other lenses on the property and on the *Lenora*.

The west ore-lens is the continuation of the ore-body as found in the upper stopes of the *Lenora*, and extends into the *Tyee* for about 125 feet; it lies above the 100-foot level, overlapping the main ore-body, but does not appear on the surface. The dimensions of this ore-lens lack definite demonstration, but may also be inferred with much safety.

It will be noted from the above that this succession of lenses is practically continuous in this property from its western boundary eastward for about 735 feet, as shown by the present development underground, with indications that this length will be considerably exceeded. On the 200-foot level no ore has been encountered, although this working has been run practically under the length of the ore-lenses, and an amount of cross-cutting has been done here, and also on the 100-foot level, to render it pretty well demonstrated that no second or parallel series of lenses exists on either of these levels. On the 300-foot level drifts had been started but not pushed for any length, as mineral was not expected here owing to the unfavourable results obtained in the lowest tunnel of the *Lenora*, which is at about the same depth. At the 400-foot level drifts have been started away, but have not been run far enough as yet to prove definitely what is in the ground at that depth. It is reported by the manager that at the bottom of the shaft green schists, carrying about 2 % copper, were encountered, which may indicate the proximity of further lenses, as in the upper levels the schist in the immediate vicinity of the lenses is thus mineralised. It has since been learned that a cross-cut to the south has cut the clay gouge and black shale noted in the upper levels, proving the continuity and regularity of the main fissuring to this depth.

While it has been said that cross-cutting from the 100-foot level developed no second series of ore-lenses, it must be noted that a cross-cut to the north of about 100 feet cut a strong parallel quartz vein of from 2 to 3 feet wide, probably identical with a surface outcropping. From this some samples were obtained giving very high gold values. Little or no drifting has been done on this quartz as yet. The general sample across the vein indicates average values of somewhat less than $10 per ton, and, in the opinion of the management, the returns obtained do not warrant its being worked at present, unless it should be required as a flux at the smelter. The ore-lenses are easily distinct from their enclosing schists and do not merge into them, although the schists are impregnated with a similar mineralisation. The ore consists of chalcopyrite carrying gold and silver values and enclosed in a matrix of quartz and barytes with some lime. Portions of the ore-lenses are richer in copper than others and permit of a certain amount of sorting, but it is probable that it will be found most economical to ship to the smelter the mass of the ore-body unsorted. The general sample of the ore, as shipped to the smelter, will run about 5 % copper, $3 to $4 in gold and about 3 to 4 ounces in silver, and such ore will carry with it 25 to 27 % barium sulphate, with a small but varying percentage of iron pyrites and quartz, while in certain parts of the mine zinc blende—to an extent of 10 to 15 %—is found associated with the heavy barytic ore.

In speaking of "ore," reference has been confined to the ore of the lenses; it is to be noted, however, that there is a large but undetermined quantity of the schists which will run about 2 % (wet) copper, with small values in gold and silver, and while these mineralised schists in themselves can scarcely be classed as ore, yet, when used as a flux, their metallic contents add materially to the product of the furnace.

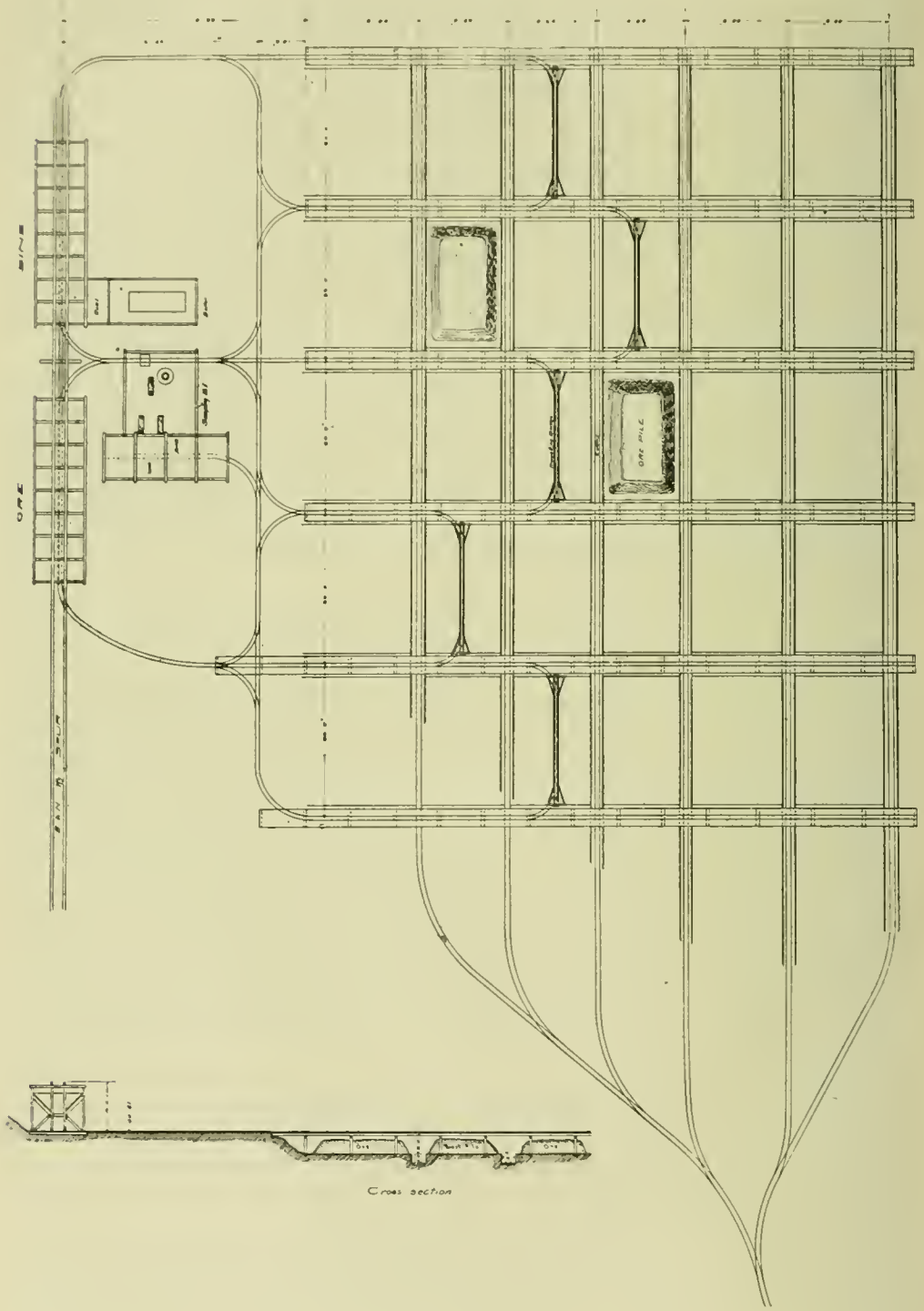
The policy of the Company has been to develop the property, but to mine as little ore as possible in so doing, until the smelter was prepared to receive it, and as the smelter was only

expected to be "blown in" late in the year 1902, but little ore had been extracted or shipped at the time the camp was visited, and the exact grade of it had not been determined. As has been noted, no ore-bodies have been found below the 190-foot level, the ore so far developed being comprised in the three lenses mentioned. These were computed by the management as containing about 60,000 tons of ore. While the ore cannot strictly be classed as "ore in sight," as it is not actually blocked out, still the bodies are so far demonstrated as to render it very highly probable that they will prove of the expected dimensions, and it is considered that the above estimate of tonnage is more than conservative, and that the present development would justify greater expectations The shaft and all drifts are exceedingly well timbered, sawed square sets being employed. The shaft is provided with a safety cage, while guides, chains, etc., are all in good order. The hoisting plant is sufficient and modern, while the shaft-house is large and substantial. An ore-sorting plant, consisting of a grizzly, crusher and travelling belt, has been ordered and should soon be in place. This will take the ore from the mine cars and deliver it into the tramway bins, which are already constructed and in use. A Riblet aerial tramway has been erected from the mine to the E. & N. Railway near Somenos, a distance of 3⅓ miles, rising from the mine bins over an elevation and then descending to the railway, some 2,000 feet below the summit where crossed. The tramway has only been in use a short time, but appears to work exceedingly well and economically, transporting 100 tons per day, at a cost of about 17 cents per ton. At the lower terminal storage bins are provided, capable of holding 400 tons of crushed ore. From these bins the E. & N. Railway cars are loaded through chutes, and the ore conveyed to the Company's smelter at Ladysmith, a description of which will be found following.

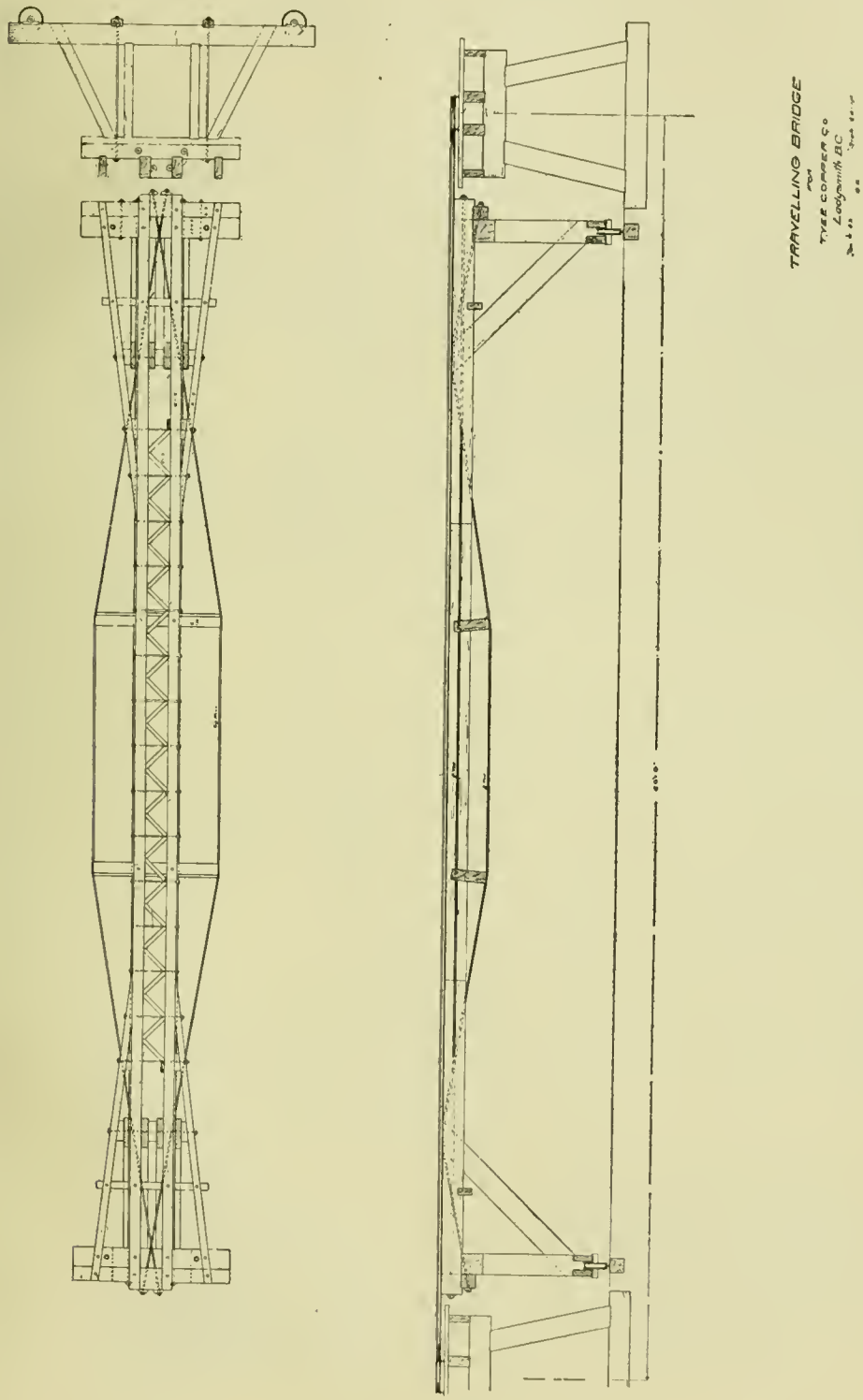
Tyee Smelter.

The Tyee Copper Company has erected a smelter at Ladysmith for the treatment of the ores from its own mine, and it is the intention of the Company to buy or take in such custom ores as it may be able to obtain from outside sources, both for fluxing purposes and with the idea of reducing costs by increased tonnage. The smelter was "blown in" the week before Christmas (December, 1902). The plant has been built under the superintendence of Mr. Thomas Kiddie, and from his plans. The smelter site consists of a long, narrow strip of land adjoining the town of Ladysmith on the north, and lying between the E. & N. Railway and the shore of Oyster bay. The highest bench of the ground is some 80 feet above high tide level, and all of this elevation has been utilised to provide for the handling of the ores by gravity. The most northerly point of the smelter site, which is also the farthest from the town, has been selected for the ore receiving bins, the sampling plant and the roast yard; this is also the highest level. A spur from the E. & N. Railway has been run, on a rising grade, to the top of the receiving bins, of which there are 16, having a total storage capacity of 1,600 tons of crushed ore. These bins are elevated so as to allow 6 feet head room underneath, and are provided with hopper bottoms and bottom discharge gates, from which the ore is run out into cars on the tram-track below.

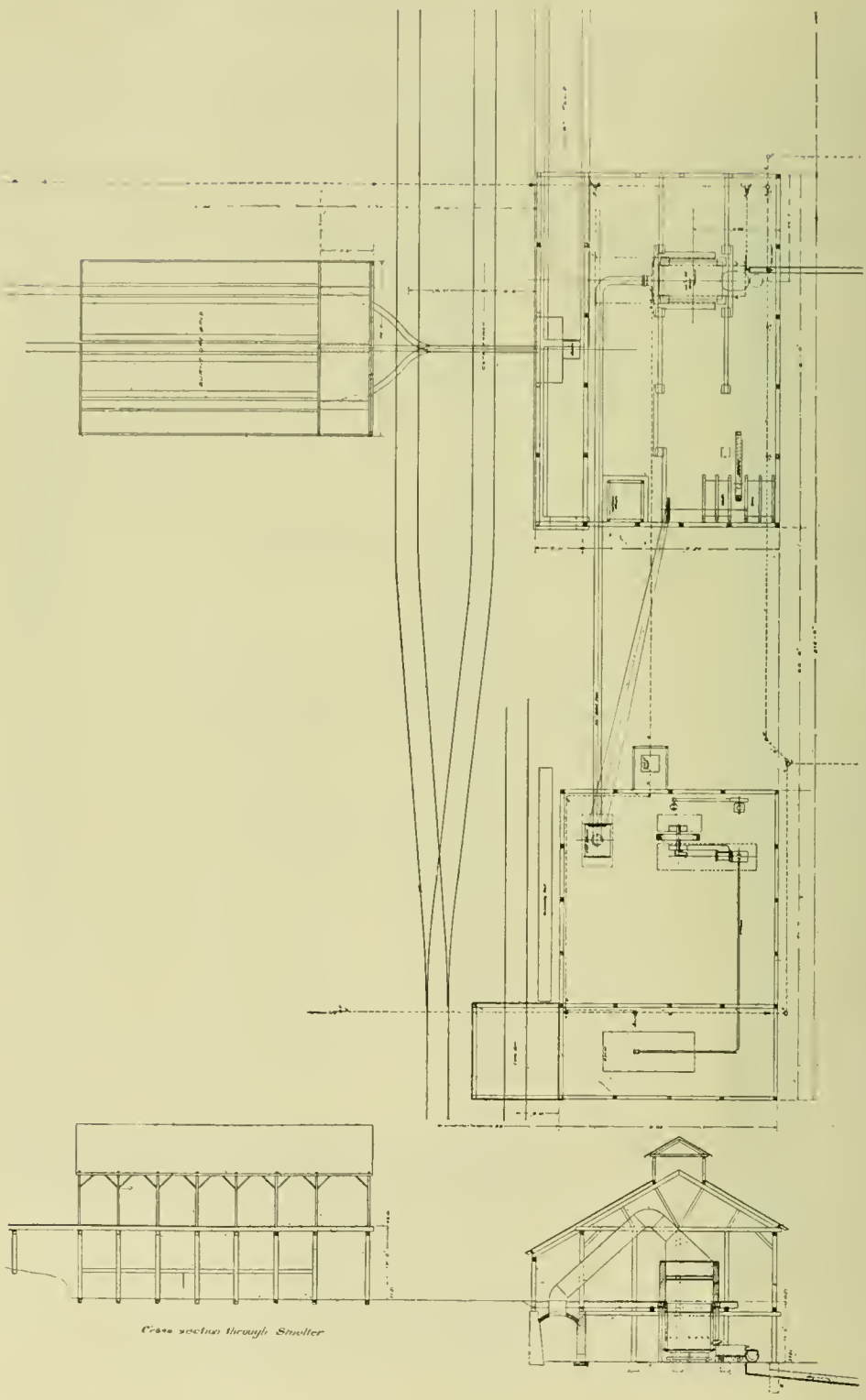
Roasting yard.—The level of the roast yard is about 8 feet below the level of the tram-track under the receiving bins. These tracks are carried lengthwise of the yard on a series of five parallel trestles. Between all these lines of trestles there are moveable bridges on wheels, which can be so moved along the space between the trestles as to bridge across from one trestle to the next at any desired point, thus traversing all the space intervening between such. These moveable bridges are provided with tram-tracks, and by the aid of moveable connecting curves on the trestles allow cars of ore coming from the bins down one line of trestle to cross by the bridge over the roast pile, where the ore is dumped, to the next trestle line, the empty car returning by this to the bins. As has been said, these bridges are moveable, and thus the loaded car may be carried at an elevation of 8 feet over any desired spot in the roast yard,



TYEE SMELTER—Plan of Roast Yard, showing arrangement and system of tram tracks.



TYEE SMELTER—Moveable Bridge, Roast Yard showing details.



TYEE SMELTER—Plan Showing Burnt Ore Bins, Blast Furnace House, Engine and Boiler House.

and can be there dumped. The roast piles, which are formed between the lines of trestle, can thus be built up by dumping the ore where required, so avoiding all shovelling, and insuring, by dumping the ore when the car is in motion, a distribution there which could scarcely be obtained otherwise.

The ore piles are built 50 feet long by 24 feet wide and 7 feet high, each containing 225 tons of ore, and are placed in a layer of about 12 inches of cordwood, using about 6 cords of wood to the pile. It takes about 4 weeks to burn a pile, and the experience with the first piles roasted indicates that the ore can be freely burned, with little danger of cintering, down to 5 % sulphur. The burnt ore is loaded into tramcars standing on a track at a sufficiently lower elevation to bring the tops of the three cars on a level with the floor of the roast yard. The burnt ore track is on a dead level grade and about 1,000 feet long, and delivers the ore-cars by a trestle over the burnt ore-bins, situated just behind the smelter building. Of these ore-bins there are 18, having a total capacity of 800 tons. They are arranged with central bottom-discharge gates, emptying into charging cars which run on rails to the smelter building, where they run on the iron plates with which the charging floor is sheathed. The charge is here dumped at the side of the furnace and is shovelled in together with the fluxes and coke, which are brought in two-wheeled charging barrows. The blast is provided by a No. 7 cycloidal blower, driven by a 4 x 36-inch Allis-Chalmers-Reynolds-Corliss engine. Steam is generated in an 80 h. p. tubular boiler. This engine also provides power for the elevator and hoist in the furnace building, the power being transmitted by a manila rope drive. A separate 17 h. p. engine is provided to run a 200-light dynamo, the whole plant being lighted with incandescent lamps.

The furnace building is 56 feet by 81 feet by 30 feet to the wall-plate, constructed of lumber and provided with a ventilator on the ridge the whole length of the building. Along the back of the building is a brick dust-flue 8 feet by 11 feet by 165 feet long, arched over and covered with corrugated iron. This flue extends outside of the building 125 feet to an iron stack, 7 feet diameter and 90 feet high, allowing room for a further extension of the furnace building when necessary. The building is designed for two furnaces, but only one has been installed as yet. There are 60 feet of space between the smelter and engine-room. The furnace is an Allis-Chalmers water jacket 42 by 120-inch section at the tuyeres, of which there are 14 of about 4 inches diameter. The furnace is constructed with one tier of jackets extending from the bottom plate up to the charging door. The height from the bottom to the tuyeres is 34 inches, and from the tuyeres to charging door is 99 inches. The section at the charging door is 70 by 130 inches. The furnace is provided with a water jacket forehearth 60 feet long, 62 inches wide and 28 inches deep, in which the matte settles and is periodically tapped out into pots, dumped into plates, crushed and finally elevated into bins, from which it is shipped. The slag from the forehearth runs over into a settling pot, from the spout of which it discharges into a sluice, is shotted and carried off by a current of water.

Lenora.

The *Lenora* mine was the first property to assume any importance in this District, and from the success which has attended its development may be said to have arisen the active prospecting which has resulted in the staking of the many claims now covering all the ground near the camp. The property was noted in the Report of this Department for 1897 as then owned by Hy. Smith, H. Buzzard, *et al.*, as being in the early stages of development, and as showing on the surface "a large body of copper-bearing material or heavily mineralised zone, in one place 30 to 40 feet wide, with a typical iron capping." Some 75 feet of tunnel had then been run, but the ore-body had not been struck underground. The property was again reported on in 1898, when the tunnel was

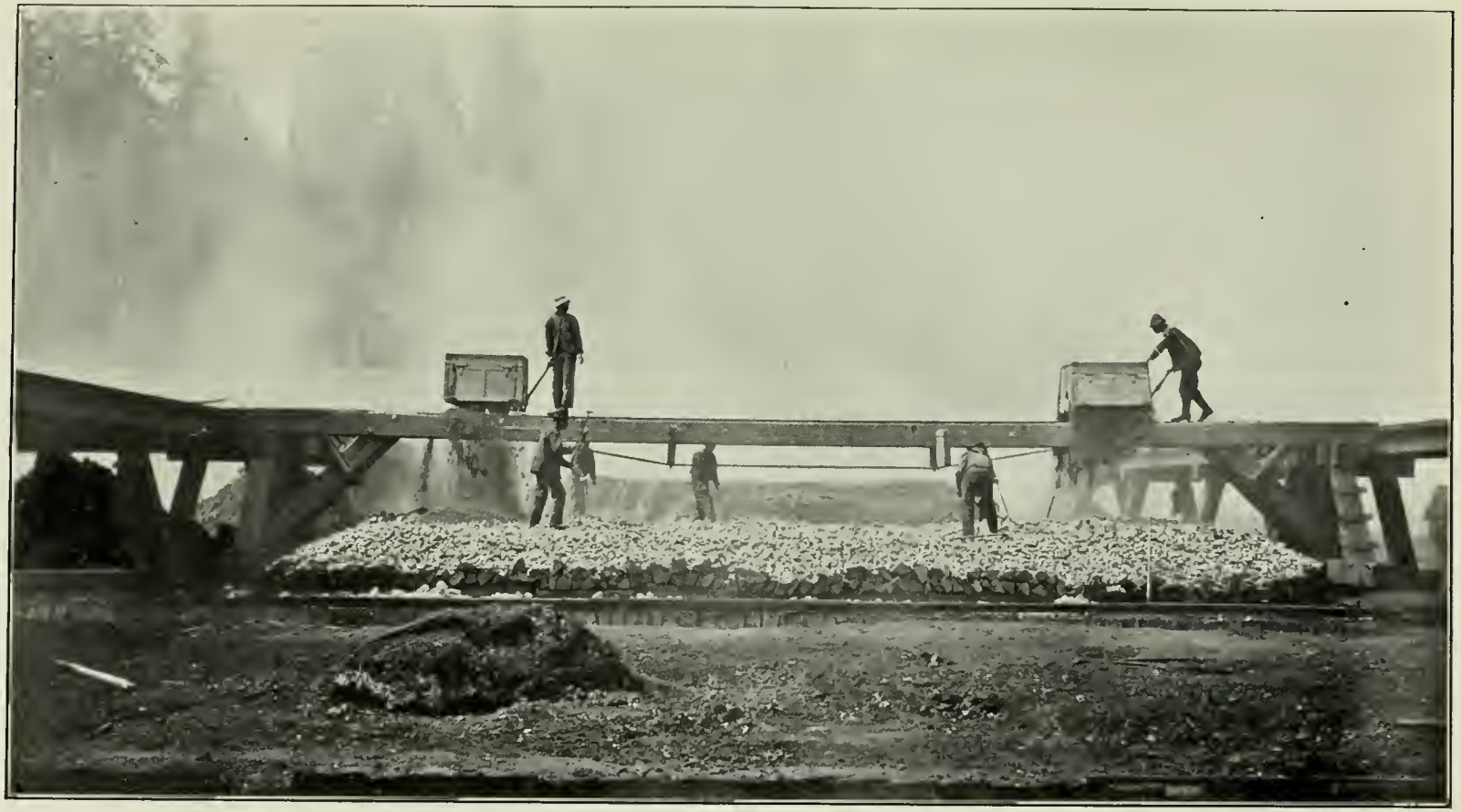
in 370 feet with cross-cuts. A body of ore had been then struck but had been drifted through. The fact that the ore occurred in lenses was not then recognised, and it was assumed to be a uniform mineralised band in the schists, so that when an attempt was made, by sinking a winze and cross-cutting from the bottom, to prove the continuity of the ore in depth, it could not be found there, with the consequence that the bond held by certain British capitalists was abandoned.

In the fall of 1898 Mr. Henry Croft secured control of the property and development was continued, with the result that a second ore-body or lens was met in drifting. The property was then taken up by the Lenora-Mt. Sicker Copper Mining Company, Ltd., with Mr. Croft as managing director and engineer. Since 1898 work has been carried on more or less regularly, with a force of from 10 to 50 men, and as the property now stands it is opened up by three tunnels driven in from the hillside, which, with the cross-cuts and counter drifts run, pretty thoroughly explore the ground within that section of the mineralised zone. To consider the tunnels in detail:—

No. 1 tunnel—or the old "Harry Smith tunnel"—was a cross-cut to the south for about 60 or 70 feet, where it struck a contact of black graphitic schists or shales with the greenish chloritic schists of the immediate country. On this contact there was some mineralisation. The cross-cut was then pushed forward for some 30 or 40 feet farther to a heavy clayey gouge, separating the schists from the diorites to the south. This gouge seems to represent the main fissuring movement of the camp, and here again there was found some mineralisation. On the contact mentioned a drift was run to the east and two fair-sized ore lenses were opened up. This drift had some 600 feet to go before striking *Tyee* ground, and of this distance about 490 feet have been driven, leaving about 110 feet of ground still not opened up by this level. The depth of this level below the surface at the *Lenora-Tyee* line would be between 160 and 170 feet, so that the section of the lead or zone possible to be opened up by the level would be a triangle of 600 feet base and a vertical height of 165 feet at one end and zero at the other. The greater part of the ore shipped has been taken from above the No. 1 level, and the stopes have been pushed to the east to within an average distance of about 200 feet from the *Tyee* line. Not all of this ground has been stoped, but most of the "shipping" or first-class ore in this portion of the mine, up to the point indicated, has been extracted.

As noted, there appears near the entrance of this No. 1 tunnel and drift to be two lines of mineralisation, the one on the contact of the greenish and black schists, and the other near the clayey gouge seam. In the workings the latter seems the stronger, and the black schists, which at this point seem to have the greatest width noted anywhere in the camp, seem to diminish in thickness as the work proceeds eastward, bringing these two lines of mineralisation nearly together, and from the evidence of the *Tyee* workings it is probable that these become permanently one line of lenses. Exactly what the number, size or shape of the ore-bodies encountered in the mine may have been it is impossible to tell, now that they are mined and the square sets all in place, as no complete mine plans showing this have been kept by the management. All that can now be ascertained is that about 500 feet along the mineralised zone has been mined of the shipping ore, and that, according to a statement prepared by the management, this has produced:—

Tons.		Gold, oz.	Silver, oz.	Copper, % wet.
1,768,	assaying	.192	3.59	6.10
1,549	"	.216	4.56	9.14
22,878	"	.166	3.50	8.02
26,195	" (average)	.1707	3.57	7.95 %.



TYEE SMELTER, LADYSMITH ROAST PILES, SHOWING MOVEABLE BRIDGE.

Also, according to a statement and estimate of the management, there was mined with every ton of this "shipping ore" about two tons of second-class ore, which was sorted out and deposited on the second-grade dump, and should, consequently, amount to about 52,000 tons, which will assay in copper, as near as can be ascertained, about 2 to 2½ % wet—say 2.3 % Cu. (wet).

If the copper contents may be taken as an "indicator" of the other values in this ore, it would argue that this dump should run:—

Tons.	Gold.	Silver.	Copper.
52,000, assaying	.05	1.03	2.3 wet

According to this statement, it figures out that the total ore mined to date, averaging the shipping ore and second-grade dump, amounts to—

Tons.	Gold.	Silver.	Copper.
78,000, assaying	.0902	1.88	4.18 %

The mine plans, which are supposed to be completed up to date, show as stoped out:—Above the No. 1 tunnel, 2,150 square sets of 5 feet by 5 feet by 6.5 feet, according to plans; and between No. 1 and No. 2 levels, 357 square sets. Total, 2,507 square sets, which, at 162½ cubic feet to set, would represent 407,387 cubic feet excavation, which, at say 10 cubic feet to the ton, would represent only about 40,739 tons of ore mined from stopes, which would indicate that the dump may not be as great as is expected, indicating a possible higher general assay for the "run of mine" ore, or that the plans do not show the stoping actually done.

The No. 2 tunnel was started as a cross-cut 220 feet long at about 65 feet lower elevation than No. 1 tunnel, being almost vertically below the line of such, and striking the ore-zone about vertically below the point it was struck in the No. 1 tunnel; in fact, it is almost a duplicate at a lower level of the No. 1, as to direction and workings therefrom. This tunnel is now about 230 feet from the east side line of the property. According to the floor plan of square sets, only about 360 out of 2,500 square sets have been used in stoping above this level—that is, about 15 per cent. of the whole—and it is fair to presume that about that proportion of the total ore came from here.

No. 3 tunnel is some 78 feet lower elevation than No. 2; it was started some 700 feet to the west of where the ore-zone was struck in Nos. 1 and 2, and has been run all the way drifting on such mineralised zone, until now, at the face, it is about 75 feet from the *Tyee* line. Cross-cuts have been driven from the tunnel at frequent intervals both to the north and south, until the diorite was struck. The total length of this tunnel and cross-cuts amounts to between 1,800 and 2,000 feet, and may be said to have explored some 1,300 feet of the mineralised zone at this elevation. The same general geological conditions as on upper levels and on the surface prevailed at this depth. Mineralisation of the schists was observed at various points, but at no place did such occur in sufficient strength to constitute a commercial ore-body of shipping grade. A winze sunk from the No. 2 tunnel is now down about 110 feet below the No. 3 level, with a cross-cut to north for 54 feet at 100 feet below. In this winze no ore-body has been struck, but it is reported by the management that the schists show marked mineralisation and appear to be "looser" than at any point below No. 2 level. This point could not be inspected, as the mine was shut down when visited, owing to certain litigation pending.

Surface Plant. The plant is laid out to eventually use No. 2 tunnel as the main outlet from the mine, as at this level the tram tracks run over the top of the receiving bins situated about 200 yards from the tunnel mouth. These bins are located alongside the railroad track and are provided with suitable discharge gates, through

which the ore is loaded directly into cars to be taken to the smelter. Up to the present, however, by far the greater proportion (about 85 %) of the ore has come from above the No. 1 tunnel, and has been run out of this working, being dumped on a sorting floor on the upper side of the track, which here turns sharply to the right after coming to daylight. This sorting floor is 2 or 3 feet lower than the track level and is covered with a rough board shed roof. The ore was here washed with a hand hose and sorted over by hand, an attempt being made to keep the grade of ore shipped up to about 8 % copper, the cobbings from this sorting being wheeled out in barrows to the second-grade dump, while the shipping ore was wheeled out and dumped down a chute into a bin standing on the level of No. 2 tunnel and delivering its ore into a car on such level, in which it was run into the receiving bins noted above as alongside the railway.

It has been noted that the ore *was* so handled; this applies up to the beginning of this past summer, up to which time the shipping ore was sent to a foreign smelter; but since the completion of the Northwest Smelting Company's (Breen and Bellinger's) smelter at Crofton, on Osborne bay, the ore has not been sorted but has been shipped direct, such procedure being possible on account of the lower costs of transportation.

The property is equipped with a good air compressor and boiler plant. The air drills are used chiefly in advancing development work, as the ore is easily mined.

This was the condition of affairs when the property was visited on November the 8th. No work had then been going on for some time, the property being in charge of the foreman. It was, therefore, impossible to personally examine anything down the winze from No. 2 tunnel, information as to this being obtained from Mr. Buxton, who for some time has been foreman of the mine.

Ore Reserves.

The Company has been run with an insufficiency of capital to enable the development to be kept well ahead of the stoping; consequently, in the stopes above the No. 1 tunnel, while there is in many cases good ore showing in the face to the east, this has not been blocked out in any way and cannot be justly figured upon as "ore in sight." There is, undoubtedly, good ore still to the east, but, from the irregular character of the ore-bodies, the amount available cannot be estimated with even any degree of accuracy. The only approximate estimate that can be made is to assume that on this level 400 feet lineal on the lode, already worked, has produced about 85 % of 78,000 tons = 66,300 tons of 4.18 % copper ore, and that there remains of the ore-zone some 200 feet more which might be expected to produce 33,000 tons additional; but as in the first 400 feet of the tunnel there were two distinct parallel ore-bodies, and in the last 200 feet these appear to be merging into one, this estimate is liable to vary either way.

Above the No. 2 tunnel, and below the No. 1, as has been noted, comparatively little stoping has been done, and it is fair to suppose that, when shipping ore was urgently needed, if it had been found here it would have been mined, as ore from this level could be handled at less expense than from the upper level. The Company's plan is marked "east end of these floors some ore showing, but work was stopped when clean ore gave out." It may be said that to the east no body of shipping ore is as yet opened up, but there are, however, 250 feet of virgin ground still to be explored. The conditions of mining here have been such that, to pay the necessarily heavy costs of transportation to and smelting at Tacoma, only ore that would sort up to 8 % copper could be mined to a profit, and, consequently, only such was developed in the mine. Now that the Crofton smelter is in operation, with much lower freight and treatment rates, a correspondingly lower grade ore may be mined. What effect this will have on the possible output of the mine, or on what may be termed ore reserves, it is hard to say, as all past development has been done on the lines indicated before.

Below the No. 2 tunnel ore is reported in the floor of the level for about 200 feet, under the stopes from the No. 2. This has not been developed or proved in any way except by the main winze (which runs to 4th level), and in this it is reported by Mr. Buxton, the foreman, that ore was found for 40 feet down, but, as the winze was logged up, this statement could not be endorsed by personal inspection.

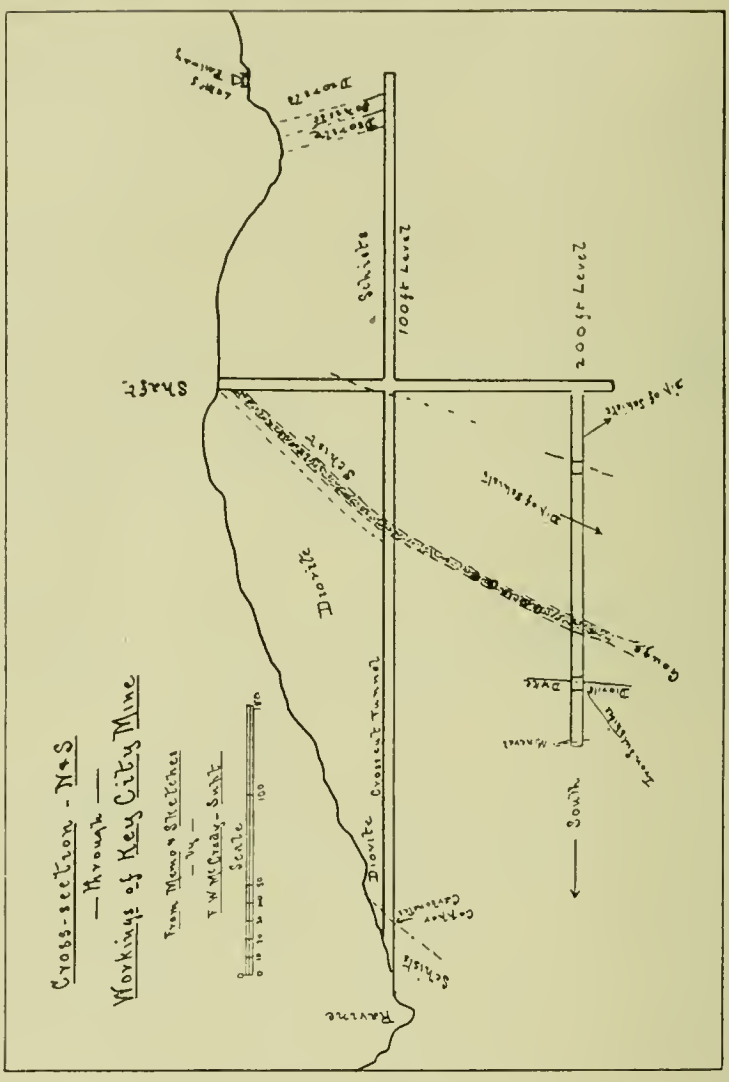
Transportation.

In the earlier days of operating the property, the sorted ore was taken by teams to Westholme station, on the E. & N. Railway. Later, a narrow gauge railway, laid at first with wooden rails, but later replaced with iron, was run from the mine to the E. & N. Railway, where bins were erected, the ore being taken by E. & N. Railway to Ladysmith and from there shipped by boat chiefly to the Tacoma smelter, though some small amount was sent to Van Anda. This method of transportation was found too expensive, so in 1901 arrangements were made with Messrs. Breen and Bellinger (the Northwest Smelting Co.), who erected a plant at Crofton, taking a contract for the smelting of the output of the mine. The narrow gauge railway was then extended over the E. & N. Railway tracks and over the Mount Richard range of hills to Osborne bay, a total distance of 8½ miles. The grades and curves employed on this road were very heavy and it was found necessary to employ "Shay"-geared locomotives, and these have only been able to handle two or three loaded cars to the train.

The Northwest Smelting Co.'s plant at Crofton was completed in the early part of this year, 1902, when a start was made to deliver ore from the mine. In October certain litigation, not necessary to detail here, was begun, and has tied up the mine ever since, no further work having been done underground and none above ground other than moving away of a part of the second-grade dump, which was the property of certain mortgagees.

Key City.

The *Key City* mine lies next to and adjoining the *Lenora*, and apparently on the same band of schists. The property is owned by the Key City Copper Mining Co., of Sacramento, Cal., of which Captain Andrew Wasson is president and general manager, and F. W. McCrady, M.E., superintendent. From the latter much of the information regarding the tunnel was obtained, as, north of the shaft, it was inaccessible. This property was opened up by a cross-cut tunnel, begun near the southern side line of the claim, adjacent to the *X. L.* and running north. This tunnel started in a gully or draw at a level of about 100 feet below the ridge on which the schist-diorite contact was noted, and was run about due north for 515 feet, cross-cutting and under this contact. The tunnel was started in schist, but after cross-cutting this for 30 feet or so, cut into diorite, in which it continued for about 200 feet. The tunnel then appears to have cut through, successively, gouge matter and black graphitic schists for 6 feet, and then through mineralised schists for 15 feet. This mineralised contact is probably the same as that occurring in the *Lenora* and *Tyee*, and which in these claims is the ore-bearing zone. Continuing northward, 215 feet of greenish schists were cut, then a 5-foot diorite dyke and then a 5-foot band of very solid quartzose rock, after which the tunnel was continued for some 25 feet in quartz schist. At 330 feet in from the mouth, the tunnel is intersected by a shaft from the surface, a vertical distance of 100 feet, and this shaft continues down to the 200-foot level. On this level a cross-cut has been made of 200 feet to the south, intersecting the gouge matter encountered in the upper tunnel and here carrying slight mineralisation of iron sulphides. The schists on this lower level seem to be much more siliceous and compact than those higher up the hill, the band being narrower and showing signs of folding and disturbances. There are several points in the schists where a small amount of iron or copper sulphides show in small stringers or in impregnations, but so far no ore has been encountered. The property is equipped with a very compact and effective hoisting plant, consisting of a 40



horse-power locomotive boiler, a Parke & Lacey hoist, and substantial head gear over the shaft, from which the rock is hoisted in an iron bucket and dumped into cars. Ventilation is provided for by a rotary fan, driven by a small vertical engine. Only temporary buildings have been erected over the machinery. Some 6 to 8 men are employed.

The Mount Sicker and Brenton Mines, Ltd.

This Company owns the *Copper Canyon Group*, consisting of the *Victoria*, *Elmore Fraction*, *Copper Canyon*, *Venture Fraction* and *Susan*, all Crown-granted mineral claims, and also the *Yankee*, *Anoka*, *May* and *Star* locations on Mount Brenton, amounting in all to about 160 acres. While some work has been done on most of these separate properties, still it may be said that serious development work has been confined to the *Victoria*, on the eastern bank, and the *Copper Canyon*, on the western bank of the Chemainus river. These claims are located along the strike of and on the same band of schists noted as occurring in the *Tyee* and *Lenora* properties, and which can be traced from these properties through both the claims under con-

sideration. The geological conditions are also almost identical, the difference being that the schists here seem more siliceous and possibly more compact and less foliated than in the *Tyee* and *Lenora*, variances to be expected in a distance of 3,000 feet horizontally and an elevation of from 800 to 1,000 feet lower.

On the *Victoria*, some 200 feet vertically above the river, a couple of small pits had been opened, exposing in one from 24 to 30 inches of quartz, mineralised somewhat with iron sulphides and a little copper pyrites, while the other pit showed several small quartz stringers parallel with the first and somewhat similarly mineralised. Directly above these pits there is reported to be a highly mineralised outcrop, which was, however, covered with snow and could not be seen. Some 80 feet vertically below these pits a tunnel had been driven in 150 feet in a S. 80° E. direction, apparently with the intention of cutting these exposures at that depth. From the inner end of the tunnel a cross-cut had been run to the south for 25 feet, and into diorite. Another cross-cut had been made to the north in the schist for 35 feet, and of this about 10 feet appeared to be mineralised with iron sulphides and possibly some copper pyrites, indicating a strongly mineralised zone in the schist. This mineralised zone is only exposed in the cross-cut and has not been drifted upon; it does not show in the main tunnel, as this is about parallel to the probable course of the zone. A rough general sample across this mineralised band, as exposed in the cross-cut, was taken and gave: Copper, trace; gold, trace, and silver, .5 oz. per ton. On the steep bank of the river outcrops of fairly solid iron sulphides were exposed, and these have been tested by tunnels a few feet long, showing a small amount of copper, while the gold values are low.

In the river bed, under water, certain small mineralised zones or lenses were visible in the schists, while on the west bank of the river, on the *Copper Canyon* claim, several of these were also seen. On the strongest of these exposures a tunnel had been driven to the west on a crushed zone, following the strike of the schists for 310 feet. A quartz vein, varying in width from 1 to 18 inches, say of an average of from 12 to 14 inches, is traceable in the roof of this tunnel for 135 feet from the mouth, at which point it stops. A cross-cut set off here for 25 feet to the north was in barren, greenish schist, cutting into the black schist near the face. At 75 feet in a second cross-cut to the north was made, and was run for 97 feet, not quite at right angles to the tunnel: this also cut the black schists. At the face of the tunnel a third (to the north) cross-cut was set off for 25 feet, this also cutting into the black schists. Cross-cuts had been made to the south at 100 feet in for 18 feet, and at the face of the tunnel for 60 feet, entirely in greenish schist. From the inner end of this last cross-cut a raise is being made to the surface, a vertical distance of about 100 feet, and was, on November 8th, up about 30 feet, with 70 feet to go.

The tunnel has been run at a level so low that it is flooded by the river at high water. It is, therefore, intended to dam up the mouth of the tunnel and convert the raise into a 5 x 9 shaft, from which further operations will be continued. The only mineralisation of any importance noted was in the quartz vein seen in the tunnel, which contains a considerable amount of iron sulphides, and some small percentage of copper with low gold values. In anticipation of fitting up the shaft as mentioned, a 40 h. p. boiler, a 28 h. p. engine, and a 5-drill air compressor, with Holman drills, are on the ground, to be erected when the raise is holed through.

It will be noted that the mineralisation here differs from that of the *Lenora* and *Tyee*, in that it is not associated with barytes and carries very little copper, but chiefly iron sulphides. It will also be noted in the *Copper Canyon* that the work has been done to the south of the black schists, and that it consists chiefly of drifting, with little cross-cutting, and so proves up but little of the schist zone.

While the location of the claims seems favourable, and the geological conditions are such as to lead one to hope for a continuation of similar ore-bodies as on the *Lenora* and *Tyee*, yet no ore-body of commercial values has as yet been indicated at this low level in any of the properties on the mountain.

*VICTORIA MINING DIVISION.

REPORT OF G. V. CUPPAGE, MINING RECORDER.

I have the honour to submit herewith the annual report on mining operations in this Division for the year ending 31st December, 1902.

MOUNTS SICKER AND BRENTON.

Tyee.

Development was steadily carried on at the *Tyee* mine throughout the year, and upon completion of the Tyee Copper Co.'s smelter† at Ladysmith, in December, regular ore shipments were begun. The success of this property has done much to stimulate interest in the District.

The *Lenora* mine suspended operations during the year, owing to legal difficulties.

Assessment work has been continuously performed and development is being carried on on the other properties in this camp, but at present sufficient money has not been expended on any particular one to place it in the list of shipping mines; the *Richard III.*, *Victoria* and *Key City* may be mentioned as amongst those on which steady progress is being made.

MOUNT RICHARDS.

A company has been formed to operate the *Lord Roberts*, *Lord Kitchener* and *General White* claims, which show good ore and are conveniently situated for shipping.

On Mount Malahat and at Sooke there are a number of promising claims, which show up well for the amount of work done.

Several promising locations of magnetic iron have been made in the vicinity of Port San Juan.

Two smelters were completed during the year, viz.: The North-Western Smelting & Refining Co.'s Smelter, at Crofton, and the Tyee Copper Co.'s Smelter, at Ladysmith. Since the latter was "blown-in," in December, work has been continuously carried on.

OFFICE STATISTICS—VICTORIA MINING DIVISION.

	1901.	1902.
Free miners' certificates issued	874	1,029
" " " special	12	5
Mining claims recorded	345	273
Placer " "	5	5
Certificates of work issued	277	462
Certificates of improvements issued	15	41
Grants of water rights for mining	5	3
Conveyances recorded	145	142
Abandonments recorded	4	1
Placer leases issued	2	4
Permits recorded	3	7
Lay-overs recorded	..	2

*See also Provincial Mineralogist's Report, p. 238.
†A description of the Tyee Smelter to be found on p. 243.

Revenue derived.

	1901.	1902.
Free Miners' Certificates	$6,488 65	$7,307 10
Mining receipts, general	2,892 35	5,244 05
	$9,381 00	$12,551 15

NEW WESTMINSTER MINING DIVISION.

REPORT OF D. ROBSON, MINING RECORDER.

I have the honour to forward for your information the following report of mining operations in the New Wesminster Mining Division for the year 1902.

From the office statistics appended it will be seen that there has been a considerable decrease in receipts from all sources, as well as in the number of transactions entered. It is to be regretted that no new discoveries or developments of importance have been made during the year. Very little has been done beyond ordinary assessment work, and none of the claims have yet been developed. I have nothing, therefore, of public interest upon which to found a report.

It was generally expected that the *Brittania Group*, on Howe sound, would have been shipping ore before the end of the year, but the reorganisation of the syndicate owning this property has not yet been completed. The value of the claims comprising this group is undoubted. The ore is low-grade, but the property is so favourably situated that it may be worked at comparatively small cost. When this property has been developed and begins to produce ore in quantity there is no doubt that adjacent claims, many of which contain the same class of ore, will quickly become active.

The 188 claims recorded during the year are scattered over a wide area. In the Howe Sound district there are 60; Sumas and vicinity, 23; Stave river, 18; Harrison lake, 10; Mount Baker, 10; Chilliwack, Wharnock and Lynn creek, 9 each; Pitt lake, 7; and the others are about Jervis inlet, Squamish, Seymour creek, Capilano creek, North Arm of Burrard inlet, Mount Lehman, and elsewhere. Two claims have been located between Coquitlam lake and the North Arm of Burrard inlet, and it is conjectured that the great tunnel now being driven by the Vancouver Power Company through the mountain between these points may disclose valuable mineral deposits.

OFFICE STATISTICS—NEW WESTMINSTER MINING DIVISION

	1900.	1901.	1902.
Free miners' certificates issued	1,439	1,208	1,038
Quartz claims recorded	483	376	188
Placer claims recorded	14	8	4
Certificates of work recorded	278	338	256
Certificates of improvements recorded	27	7	5
Conveyances recorded	81	119	53
Revenue.			
Free miners' certificates	$10,488 00	$ 8,089 98	$6,181 56
Mining receipts, general	2,436 00	4,033 80	2,581 50
	$12,924 00	$12,123 78	$8,763 06

INSPECTION OF METALLIFEROUS MINES.

REPORT OF JAMES MCGREGOR, INSPECTOR.

I have the honour to submit my annual report for the year 1902, with respect to the condition of the metalliferous mines in my District.

Slocan.

The mines in this District have not been operated to so great an extent during the past year, owing to the state of the metal market. Development work has been carried on to some extent in several of the mines, and in all cases great care has been taken in timbering, while the travelling and ladderways are in good condition and comply with the Act. The machinery I found in perfect order and, where workmen were raised, lowered or transported in any way, every precaution was taken. Especial care has been observed in the thawing and hauling of powder. The system of ventilation generally is natural, assisted by small fans run by water power or compressed air, in connecting main airways.

Trail Creek.

In this District the deepest metalliferous mines are operated by shafts, and an immense amount of timbering is used, principally on the system known as "square setting," where a great deal of skill and care is necessary. I have found in all my visits, which I endeavour to make monthly to the larger mines, that the timbering is well done and kept as close as possible to the face of the different levels and stopes. I also find the travelling ways kept in good condition and conforming with the Act governing such. The signalling system is as perfect as possible. To cages and guides used in shafts I find, in all cases, that safety catches are attached, and that they are tested frequently. I am often present at these tests and, in every instance, find them to work perfectly. The ropes used are all of the highest grade, well kept, and are examined carefully by a competent man. The machinery is also in good condition, and any new machinery installed is of the most improved type. In some instances automatic brakes have been attached to prevent overwinding, which I consider a great benefit and source of safety.

The main supply of ventilation in these mines is natural. In a few instances it is found necessary to erect small fans until connections are made with main airways.

The powder magazines and thawers are kept in places of safety, and only enough powder taken into the mines for immediate use.

Boundary.

Most of the mines in this District are operated on a different system to those of Trail. The majority are worked partly by open cuts and partly by pillar and room; others by open cut entirely, and a few by shafts.

Where timbering is used it is well and carefully placed, much attention being necessary, as the ground in places is very treacherous, necessitating constant vigilance on the part of both management and men. The ropes, safety catches and travelling-ways I always find in good condition and carefully watched.

Nelson.

The mines in this District are not so numerous as in the other districts mentioned, and are principally tunnel propositions. Where timbering is necessary, square sets are used in most places, and where stoping is being

NORTH-WESTERN SMELTING AND REFINING COMPANY'S SMELTER AT CROFTON, V. I.

done in the narrow veins, stalls are used instead. Particular care is taken in handling and thawing powder, the Act being carefully complied with. The ventilation is natural, excepting when air pipes and blasts are used.

In the Ainsworth District less mining has been done during the year, but development work has been prosecuted.

During the past year I have not had any objection raised by the managements of the different mines throughout my District to any suggestions made by myself *re* changes for the safety of the workmen, and no complaints have been received from the workmen.

REPORT OF ARCHIBALD DICK, INSPECTOR.

I have the honour to submit my report for the year 1902 as Inspector of Metalliferous Mines for the East Kootenay District and the Goat River Mining Division of West Kootenay.

I have visited and inspected several of the mines in Goat River Division, although there were none of them shipping, development work only being done. I have been frequently at the mines about Moyie, Kimberley and Perry Creek, and, with the exception of the *North Star*, which is shipping, all the others are at present inoperative. The *St. Eugene* worked up to August, 1902, but did not ship any ore.

REPORT OF THOS. MORGAN, INSPECTOR.

I have the honour to submit my report for the year 1902, as Inspector of Metalliferous Mines for Vancouver Island and Texada island

Golden Eagle. This mine is situated at the head of China creek, about 18 miles from Alberni, and was inspected by me on April 30th, 1902, my official report being duly made to the Department of Mines. The work is carried on by a tunnel and a sufficient quantity of air was supplied to the workmen, the motive power being a small fan driven by water-power. No accidents were reported during the year.

Lenora. This mine is situated at Mount Sicker, and my last inspection was made on June 2nd, 1902, and my offical report forwarded. No accidents occurred during the year in this mine, which is well ventilated by natural ventilation, and the workings are in a safe condition. The railroad has been extended during the year from the E. & N. Railroad crossing to Crofton, a distance of about six miles, for the transportation of the ore from the mine to the Crofton smelter.

Tyee. This mine is also situated at Mount Sicker, and my inspection was made on June 3rd, 1902. No accidents have been reported during the year. The shaft is well timbered and the ladder-way quite safe. The ventilation is good, the motive power being natural, assisted by a small force fan. An aerial tramway has been built from the mine to the E. & N. Railway, a distance of $3\frac{1}{3}$ miles. The bunkers at the mine have a capacity of 100 tons, and at the E. & N. Railway there are two bunkers with a capacity of 200 tons each.

The tram is operated by a 4 h. p. engine. The capacity of buckets used is half a ton. The hoisting engine at the shaft is a link motion, double-drum engine; size of cylinders, 10 by 14 inches; diameter of reels, 4 feet.

Marble Bay. I inspected this mine, situated on Texada island, on November 25th, 1902. The shaft is in good order with safe ladder-ways. The mine is ventilated by natural ventilation, assisted by compressed air, and is very

satisfactory. The mine is well timbered wherever necessary and no accidents have been reported during the year. New bunkers, capable of holding 500 tons, have been built at deep water, and a tramway constructed from the mine to the bunkers, for transporting the ore.

Cornell.

My inspection of this mine, situated on Texada island, took place on November 25th, 1902, and was duly reported to the Department of Mines. A bucket with a cross-head, held in place by guides, was used for bringing the ore to the surface, but the superintendent informed me that they were going to change the guides and put a cage in instead of the bucket. The workings of the mine were all safe and the ventilation, both natural and compressed air, was very satisfactory.

On December 9th an accident occurred in this mine by which Louis Delatre lost his life. From the evidence of James Raper, night foreman of the *Cornell* mine, Wm. R. Hocking, Wm. Law, Jos. Schufer, miners; D. Jones, hoist engineer; G. Hughes, topman; and Robert Holburn (the latter being deceased's partner), it appears that the accident occurred as follows: Deceased and Robert Holburn were 380 feet down in the *Cornell* shaft on the night in question, for the purpose of lighting eleven fuses. Nine of the eleven had been lit when the deceased and Robert Holburn gave instructions to Andrew Law to signal the hoist engineer to pull them up. The latter immediately obeyed the signal, intending to hoist them to the 260-foot level. When, however, they were passing the 300-foot level, one of the shots went off, causing the bucket to sway violently. The two men were caught unawares, lost their hold on the bucket and fell down to the bottom of the shaft, a distance of about 20 feet. While they were lying there five or six more shots exploded, and it is probable that deceased was killed by these later explosions. Robert Holburn received only slight injuries, both from the fall and from these subsequent explosions.

Mr. T. J. Vaughan Rhys, the manager, testified as follows:—

That the powder in use at the time was 70 % gelignite; caps were No. 6 detonators, and the fuse was Bickford; that from tests made at various times the fuse burns an average of one foot in 45 seconds; that the signal apparatus and hoisting gear were in good order, and that all the men involved in the matter were experienced, sober and trustworthy workmen. No inquest was held.

If an electric battery had been used to fire these shots, this accident would not have occurred. I consider that the firing of shots in a shaft by a fuse should be disallowed by the Act.

LIST OF ACCIDENTS IN METALLIFEROUS MINES, 1902.

NOTE.—The total number of fatal accidents was 12.

January	30—Geo. Fredericks, shoveller, Le Roi mine, leg broken by falling down chute.
"	30—Peter B. Holcomb, ropeman, War Eagle mine, killed in shaft.
"	30—John McIntosh, mucker, Granby mine, eyes badly injured by unexploded powder.
"	31—G. M. Miller, shoveller, Le Roi mine, arm crushed and broken at wrist by a car.
February	1—Hugh Gillis, miner. Knob Hill mine, eyes injured by blast.
"	6—Robert Milner, machine man, Le Roi mine, slight accident to hand.
"	7—Frank Wawers, shoveller, Le Roi mine, cut over the eye.
"	8—Matthew Martinson, timberman, Le Roi mine, cut on top of head and over eye.

February 21—James Crafton, machine man, Le Roi mine, cut on the face and otherwise slightly injured by drilling into missed hole.
" 26—E. N. Warden, miner, Le Roi mine, knee-cap injured slightly by rock falling.
" 26—Thos. Wilson, shoveller, Le Roi mine, slightly injured by scraper falling on head.
March 2—Anthony Ryan, miner, Knob Hill mine, killed by a fall of rock in Glory hole.
" 2—Richard Murphy, timberman, Le Roi mine, injured on the mouth by plank.
" 12—M. Radovich, shoveller, Le Roi mine, injured by walking into chute.
" 20—L. G. Smith, cage tender, Le Roi mine, slightly injured by slipping down foot-wall.
" 20—Joe Garber, blaster, Josie mine, hand slightly injured by rock.
" 20—Fergus McQuarry, mucker, Golden Crown mine, killed in shaft.
" 27—J. C. McFarlin, shoveller, Le Roi mine, rib broken by rock falling out of chute.
" 31—Harry Broadhurst, miner, Le Roi mine, killed by blast.
" 31—Fred. Wells, miner, Le Roi mine, slightly injured by blast.
April 1—Erick Erickson, shoveller, Le Roi mine, slightly injured by falling on a wheelbarrow.
" 8—Chris. McKay, shoveller, Le Roi mine, injured by rock falling on him.
" 11—W. Robertson, hoist engineer, Le Roi mine, leg broken ascending shaft in bucket.
May 8—P. Conway, mucker and carman, was killed at the North Star mine. He was coming out with the car, and it went too fast, so that when it got to the dump it went over, carrying Conway with it.
" 14—F. M. Foster, shoveller, Le Roi mine, slightly injured, being cut on head by falling stone.
" 16—Richard Silverthorn, blaster, Knob Hill mine, seriously injured by a blast.
" 18—P. H. Craven, miner, Le Roi mine, slightly injured by blast.
" 28—Richard Parker, miner, Le Roi mine, collar-bone broken by fall of rock.
" 29—Norman Silby, pump man, Nickle Plate mine, slightly injured by cage in shaft getting beyond control of engineer.
" 29—James Williamson, carpenter, Nickle Plate mine, broken leg and rib by cage getting beyond engineer's control.
" 29—R. M. Croft, miner, Nickle Plate mine, arm and leg broken by cage getting beyond engineer's control.
" 29—James Readin, miner, Nickle Plate mine, back strained by cage getting beyond engineer's control.
" 29—Frank Amemlia, shoveller, Nickle Plate mine, fractured ankle.
" 29—Jay Gould, shoveller, Nickle Plate mine, compound fracture of arm.
" 29—Napolien Wells, shoveller, Nickle Plate mine, ankle fractured.
June 5—Frank Preston, shoveller, Le Roi mine, foot sprained slightly by falling into chute.
" 6—J. McClusky, miner, Knob Hill mine, seriously injured by a premature explosion of powder.
" 11—Charles Hastings, miner, Le Roi mine, thigh broken by a bucket at bottom of winze.
" 18—S. Pattersen, cage helper, Le Roi mine, toe broken by cage in shaft.
" 23—P. C. Jones, mucker, Knob Hill mine, compound fracture of jaw while taking ore out of a chute.

July 13—John McLean, shoveller, Le Roi mine, injured head and shoulder on timber slide.
" 24—John Juboy, carman, Knob Hill mine, painful injury to ear and wrist by car falling over.
" 27—L. A. Dunkl, manager, Le Roi mine, killed by a cave.
" 27—Daniel Gun, timberman, Le Roi mine, slightly injured about the legs by cave.
" 27—Wm. L. McDonald, timberman, Le Roi mine, slightly bruised about the legs by a cave.
August 5—Joseph Taylor, miner, Le Roi mine, slightly injured by fall of rock.
" 7—Frank Vickers, timberman, Le Roi mine, leg painfully bruised while setting post.
" 7—J. M. Worth, timberman, Le Roi mine, slightly injured foot with axe.
" 23—Josiah Lobb, miner, Le Roi No. 2 mine, drowned in shaft by inrush of water from the Annie shaft.
" 23—C. Hoskins, miner, Le Roi No. 2 mine, drowned in shaft by inrush of water from the Annie shaft.
" 30—Samuel Patterson, cage tender, Le Roi mine, slightly injured about the legs by the cage catching the rail of the chute of the 600-foot level.
October 9—David Keir, carman, Slocan Star mine, killed by a fall of rock from the foot-wall.
" 22—Harry Adams, miner, Le Roi mine, severely injured by a fall of rock.
" 22—Peter Loose, miner, Le Roi mine, slight flesh wound while rigging up machine.
" 23—Chas. Grundy, shoveller, Le Roi mine, slight cut on face by rock in chute.
" 27—John M. Swan, miner, Le Roi mine, fatally injured by machine drill while passing.
November 1—Harry Perry, timberman, Centre Star mine, leg broken by piece of ore rolling down the pile.
" 13—L. J. Bruce, shoveller, Le Roi mine, slightly bruised about the back by falling rock.
" 14—John Anderson, miner, North Star mine, East Kootenay, slightly hurt by shot.
" 19—Thos. Burden, miner, Le Roi mine, fatally injured by falling from ladder-way into chute.
" 29—John J. McAuley, miner, Knob Hill mine, broken nose by drilling machine falling, striking a board on which he stood.
December 1—Geo. Wilcox, pipe fitter, Centre Star mine, leg broken and head injured by a plank breaking on which he was walking.
" 1—Geo. Erickson, timberman, Le Roi mine, painfully injured, arm cut by nail.
" 9—Louis Delatre, miner, Cornell mine, Texada island, killed by shot in shaft.
" 24—Wm. Hankey, nipper, Ymir mine, killed by falling down ladder-way.

COAL MINING IN BRITISH COLUMBIA.

The only coal fields in British Columbia actually working at the present time are those on Vancouver Island and the collieries of the Crow's Nest Pass Coal Co., situated on the western slope of the Rocky mountains. Coal exists in many other parts of the Province and a good deal of prospecting has been carried on, but so far no serious development has been done, chiefly for the reason that no facilities existed for transporting the output to a market and that no local market has as yet been created. The coal deposits of the Queen Charlotte islands were visited during the year by Dr. T. R. Marshall, and his report will be found on pages 54 to 58. Nothing further has been learned regarding the locations of coal in Yale district, which were visited by the Provincial Mineralogist in 1901 (*See* pages 1147, 1156, 1175, 1177, 1183 and 1184, Minister of Mines Report for 1901), nor of the deposits on Peace river, Skeena river and in Bulkley valley. A company has been formed to prospect for coal in the vicinity of Kamloops and it is reported that steps are being taken to develop the deposits on the north fork of the Kettle river.

Analysis of British Columbia Coals.

For the purpose of showing exactly the quality of the coals of the Province, a series of analyses were made during the year at the Provincial Government Laboratory of as many of the working coal seams as it was possible to get reliable and average samples from, and the table given below contains the results of these analyses.

In order that these analyses should have commercial value as truly representing the seams in question, it was determined to get samples as nearly as possible representing, commercially, the shipping run of the coal.

To this end the Provincial Mineralogist instructed the Inspectors as follows:—

"I would ask that you procure me average samples from as many of the coal seams as you conveniently can.

"The samples required from each seam would be about 20 lbs., which should be a fair and honest sample of the coal *as it can be mined for shipment*, not selected samples.

"It is imperative that the samples should be authentic and fair, which is one reason why I ask you personally to see to its being taken and shipped."

The samples analyzed were taken by the Inspectors as instructed, not by a representative of the Coal Company interested, and represent a commercial product and not a selected specimen, such as is too often taken for analysis.

The results, being on average samples, are somewhat lower than could have been obtained from selected samples, but indicate an exceeding high grade of bituminous coals.

The following table shows the analyses of the coals forwarded :—

	Moisture.	Volatile Combustible Matter.	Fixed Carbon.	Volatile Matter and Fixed Carbon.	Ash.	Sulphur	British Thermal Units.
UNION, VANCOUVER ISLAND.							
1. No. 5 Pit, Union, Upper seam	1.08	29.24	57.03	86.27	9.6	3.05	13,261
2.—Hamilton Lake	1.7	22.82	47.72	70.54	27.0	.76	10,626
3. —No. 4 Slope, Comox or Lower seam	.88	27.34	61.82	89.16	8.7	1.26	13,881
4. —No. 5 Pit, Comox or Lower seam	1.32	27.62	63.64	91.26	6.7	.72	14,191
5. —No. 6 Pit, Comox or Lower seam	1.26	27.33	63.49	90.82	6.8	1.12	14,191
NANAIMO, VANCOUVER ISLAND.							
6.—No. 1 Shaft, Esplanade, Upper seam; dip 1 in 10 E.	1.88	33.27	54.67	87.94	9.4	.78	12,672
7.—No. 1 Shaft, Esplanade, Lower seam; dip 1 in 10 E.	2.86	35.84	54.79	90.63	5.5	1.01	12,951
8.—Harewood Mine; dip 1 in 10 E.	1.58	33.84	52.17	86.01	11.85	.56	12,238
9.—No. 5, Southfield Mine	2.08	35.78	56.26	92.04	5.6	.28	13,261
EXTENSION, VANCOUVER ISLAND.							
10.—Bottom vein, Extension seam; pitch 15 to 20 S., 25 W.	1.28	35.26	55.83	91.09	7.30	.33	13,199
11.—Top vein, Extension seam, pitch as in No. 10	1.24	36.49	53.72	90.21	8.20	.35	13,261
12.—Bottom seam, Tunnel vein; pitching S., 12 W., angle 10	1.52	35.27	57.04	92.31	5.85	.32	13,416
13.—Top seam, Tunnel vein; pitching same as No. 12	1.44	31.40	46.18	77.58	20.65	.33	11,401
14.—Comox Coke	.74	1.26	80.60	81.86	17.40	....	11,215
CROW'S NEST.							
15.—No. 1 Mine, Morrissey; highest seam worked; 18 feet thick; dip to N. 21°; strike E. and W.; suitable for steam	.9	22.19	70.99	93.18	5.6	.32	14,346
16.—No. 4 Mine, Morrissey; seam 18 feet thick, with pitch and strike as in No. 15; suitable for steam and household	.82	11.73	71.5	83.23	15.75	.2	12,858
17.—No. 1 Mine, Coal Creek, north side of creek; seam 8 feet thick; dip to E. 15°; suitable for steam and household	.84	22.38	73.17	95.55	3.15	.46	14,935
18.—No. 1 Mine, Coal Creek; seam 9 feet below No. 17; 9 feet thick; dip to E. with incline of 15°; used for steam and household	.92	18.85	64.42	83.27	15.65	.16	13,757
19.—No. 2 Mine, Coal Creek; seam 6 feet thick; dip 15° E.; strike N. and S.; used for steam and house.	.84	22.38	73.17	95.55	3.15	.46	14,935
20.—No. 3 Mine, Coal Creek; same seam and same conditions as No. 19; samples taken 1 mile apart	.92	20.63	72.05	92.68	6.0	.4	14,284
21.—No. 4 Mine, Coal Creek; 750 feet below No. 1; seam 22 feet thick, with dip to E.; incline 10°	.96	13.46	61.92	75.38	23.5	.16	12,114
22.—No. 3 Mine, Michel; highest seam worked; thickness 15 to 30 feet; used for steam and coke	1.	20.57	72.	92.57	6.15	.28	14,656
23.—No. 4 Mine, Michel; 80 feet below No. 3; 10 to 30 feet thick; used for steam and coking	1.	18.93	70.13	89.06	9.5	44	13,850

For purposes of comparison, a number of analyses are given below, principally from the State of Washington, but also from other coal fields of the world. The following are analyses of coals from the State of Washington (Report of the State Inspector of Coal Mines, 1901-1902):—

	Moisture.	Volatile Combustible Matter.	Fixed Carbon.	Volatile Matter and Fixed Carbon.	Ash.	Sulphur
1.—Mine No. 2, Black Diamond	4.10	40.90	50.73	91.63	4.27	.76
2.—Morgan Slope, Black Diamond	4.32	43.18	49.81	92.99	2.69	.47
3.—Mine No. 14, Black Diamond	6.28	41.22	50.30	91.52	2.20	.39
4.—Shaft, No. 4 Mine, Roslyn	1.90	38.20	49.40	87.60	10.50	.41
5.—Cle-Elum opening, Roslyn	6.34	37.86	48.30	86.16	7.50	.49
6.—New Dip, No. 2 Mine, Roslyn	2.08	38.21	49.09	87.30	10.63	.45
7.—Davis Mine, Claquato	1.21	8.39	72.30	80.69	18.10	.98
8.—Renton Co-operative Coal Co., No. 2 Vein	10.02	38.18	47.92	86.10	3.88	.53
9.— " " " No. 1 "	10.31	37.89	41.15	79.04	10.65	.47
10.—Occidental, Renton, No. 1 Vein	4.06	32.78	58.52	91.30	4.64	.58
11.—Renton Co-operative Coal Co., No. 2 Vein	3.44	37.38	53.60	90.98	5.58	.73
12.—Occidental, Renton, No. 3 Vein	4.60	27.80	59.69	87.49	7.91	.48
13.— " " No. 4 "	2.50	34.71	48.38	83.09	13.40	.56
14.— " " No. 5 "	1.51	39.50	48.98	88.48	10.01	.59
15.— " " No. 6 "	2.02	37.40	52.55	89.95	8.03	.68
16.— " " No. 10 "	3.00	37.10	47.29	84.39	12.61	.70
17.—Green River Coal, per R. Young	2.96	32.31	60.69	93.00	4.04	.93
20.—Lindberg Grocery Co., Tacoma	2.43	33.10	57.37	90.47	7.11	1.40
21.—I. Buchanan, Cle-Elum	2.91	44.79	45.81	90.60	6.49	.71
22.—N. P. Cars, No. 31,349, etc., Roslyn coal	5.02	37.00	40.63	77.63	17.35	.47
23.—Skagit Coal & Coke Co., Cokedale, Wash	.53	26.67	64.51	91.18	8.29	.68
24.—Wilkeson Coal & Coke Co., No. 1 Mine	.63	28.11	61.53	89.64	9.73	2.09
25.— " " No. 2 "	1.02	26.72	63.82	90.54	8.44	1.90
26.— " " No. 3 "	.53	32.10	65.20	97.30	2.17	1.86
27.— " " No. 7 "	.42	25.12	62.42	87.54	12.04	1.11
28.—North One Vein, Carbonado	1.34	35.22	56.67	91.89	6.77	1.43
29.—No. 8 Vein, Carbonado	1.16	35.87	57.88	93.75	5.09	1.32
30.—No. 4 " "	1.02	37.02	49.12	86.14	12.84	....

In order to obtain an analysis of an average sample of Washington coal as it is imported into British Columbia, a ton of the product of the Roslyn mine was purchased from the local dealers in Victoria and was sampled and analysed at the Government Laboratory. The following is the result of this analysis:—

	Moisture.	Volatile Combustible Matter.	Fixed Carbon.	Volatile Matter and Fixed Carbon.	Ash.	British Thermal Units.
Coal from Roslyn Mine, Washington	2.9	31.6	50.6	82.2	14.9	12,021

For further purposes of comparison, the following table of laboratory analyses, taken from an article read before the American Institute of Mining Engineers by Mr. W. Routledge, Manager of the Reserve Colliery, Cape Breton, and used by him as a table of comparison of the various well-known bituminous coal districts of the world, will be found of interest. The last column, "Total Fuel," or "Total Combustible Matter," has been added to Mr. Routledge's table, and, as will be seen, it is simply the addition of the vol. comb. matter and fixed carbon. It will be noted that Mr. Routledge includes hygroscopic water under the head of "Volatile Matter":—

Locality.	Country.	Volatile. Matter.	Fixed Carbon.	Ash.	Total Fuel.
Pennsylvania	U. S. A.	29.50	64.40	6.10	93.90
Virginia	"	33.68	57.76	8.56	91.44
Indiana	"	39.00	52.00	9.00	91.00
Illinois	"	36.59	59.47	3.94	96.06
Iowa	"	44.00	48.50	7.50	92.50
Missouri	"	34.06	50.81	15.13	84.87
Newcastle	England	37.60	57.00	5.40	94.60
Staffordshire	"	37.86	59.64	2.50	97.50
Derbyshire	"	35.10	61.65	3.25	96.75
Yorkshire	"	35.67	62.08	2.25	97.75
North Wales	Wales	36.56	57.49	6.25	93.75
Pictou	Nova Scotia	29.63	56.98	13.39	86.61
Sydney	Cape Breton	34.07	61.43	4.50	95.50
Crow's Nest Coal, taken on same basis as above.					
No. 2 Tunnel—Coal Creek		21.02	76.25	2.73	97.27
"		25.00	72.50	2.50	97.50
Peter Seam—Martin's Creek		34 70	58.30	7.00	93.00
Jubilee Seam, "		31.70	68.30	4.20	95.80

The Vancouver Island Collieries.

A decrease of 87,851 tons took place in the production of Vancouver Island collieries in 1902, while there was an increase of 20,178 tons of coke (*see* pg. 17). As pointed out elsewhere, when it is considered that a large proportion of the output of the Coast mines is used in California, and that petroleum fuel has been introduced into that State to so great an extent, it is remarkable that the falling off has been so slight. On the other hand, the increased production of coke is principally due to the demand for this commodity in the United States. A detailed description of the Vancouver Island collieries is found in the report of the Inspector, which follows.

Crow's Nest Pass Collieries.

The production of the Crow's Nest Collieries was about the same as in 1901, the coal output showing a slight increase, and the coke a slight decrease (*see* p. 18). That the production was not at least doubled must be attributed to the serious disaster in May, 1902 (*see* accidents), and to one or two "strikes" which followed.

The following table shows the production of coal and coke by British Columbia collieries and the distribution of the output, together with the number of men employed and the wages paid for each class of labour, etc.:—

Coal and Coke Produced, Exported, etc.

Sales and Output for Year.	Coal.				Coke.			
(Tons of 2,240 lbs.)	Tons.	cwt.	Tons.	cwt.	Tons.	cwt.	Tons.	cwt.
Sold for consumption in Canada	422,466	13			85,071			
" export to U. S.	775,300	11			38,780			
" " to other Countries	1,508							
Total Sales			1,199,275	04			123,851	—
Used in making coke	244,232							
Used under Colliery Boilers, &c.	171,172	15						
Total for Colliery Use			415,404	15				
Stocks on hand first of year	5,704	17			186			
" last of year	32,651				4,350			
Difference added to stock during year			26,946	03	4,164		4,164	—
Output of Collieries for year			1,641,626	02			128,015	—

By products:—Fire clay, 813 tons.

Number of Hands Employed, Daily Wages Paid, &c.

Character of Labour.	Underground.		Above Ground.		Totals.	
	No. Employed.	Average Daily Wage.	No. Employed.	Average Daily Wage.	No. Employed.	Average Daily Wage.
Supervision and Clerical Assistance	63	$4 30	48	$4 85	111	$4 57
Whites—Miners	1,625	4 30			1,625	4 30
Miners' Helpers	494	2 40			494	2 40
Labourers	569	2 73	206	2 34	775	2 53
Mechanics and Skilled Labour	47	2 81	199	3 10	246	2 95
Boys	133	1 42	23	1 15	156	1 28
Japanese	38	1 37	46	1 12	84	1 24
Chinese	132	1 37	388	1 21	520	1 29
Indians						
Totals	3,101		910		4,011	

REPORT ON THE INSPECTION OF VANCOUVER ISLAND COAL MINES.

THOS. MORGAN, INSPECTOR OF VANCOUVER ISLAND COLLIERIES.

I have the honour, as Inspector of Coal Mines for Vancouver Island, to submit my Annual Report for the year 1902.

The total output of the Vancouver Island coal mines for the year 1902 was 1,247,665 $^{1}/_{6}$ tons, while the output for 1901 was 1,312,202 tons. The excellent quality of coal produced by the Vancouver Island collieries has been in constant demand, and has been steadily supplied to local and foreign markets. The following collieries were operated on Vancouver Island during the year 1902:

The Nanaimo Colliery, owned by the New Vancouver Coal Mining and Land Company, Ltd., consisting of No. 1 Shaft, Esplanade, in Nanaimo; Protection Island Shaft; No. 5 Shaft, Southfield; and Harewood Mine.

Wellington Colliery, in Cranberry District, comprising Nos. 1, 2 and 3 Slope Mines, and the Tunnel Mine, worked by the Wellington Colliery Company, Ltd.

Wellington Colliery, in Comox District, which includes No. 4 Slope and Nos. 5 and 6 Shafts, also operated by the Wellington Colliery Company, Ltd. Coke and bricks are also manufactured at Union Bay in connection with this latter Colliery.

The general statistics of the Vancouver Island coal industry for 1902 are as follows:—

AGGREGATE SUMMARY OF RETURNS FROM VANCOUVER ISLAND COLLIERIES FOR THE YEAR 1902.

Tons of 2,240 lbs.	Tons, Coal.	cwt.	Tons, Coal.	cwt.
Sold for consumption in Canada	310,765	10		
" export to other Countries	1,508	—		
" " United States	673,524	10		
Total sales			985,798	
Used in making Coke	73,772	—		
" under Colliery Boilers	161,148	19		
Total for Colliery use			234,920	19
			1,220,718	19
Stock on hand first of year	5,704	17		
" last of year	32,651	—		
Difference taken from stock during year			26,946	3
Output of Collieries for year 1902			1,247,665	2

Number of Men Employed in Vancouver Island Collieries.

Character of Labour.	Number Employed.		Total Number Employed.
	Underground.	Surface.	
Supervision and clerical	39	31	70
Whites—Miners	1,202	.....	1,202
Miners' helpers	428	.....	428
Labourers	354	83	437
Mechanics and skilled labour	27	148	175
Boys	116	16	132
Japanese	38	46	84
Chinese	132	367	499
Totals	2,336	691	3,027

Vancouver Island coal has been exported to the State of California, the Hawaiian Islands and Alaska.

The mail steamers crossing the Pacific also received coal for fuel to a large extent.

Coke has been exported to San Francisco.

The following statement shows the relative position of British Columbia coal exports in the market of California.—

	1900.	1901.	1902.
	Tons.	Tons.	Tons.
British Columbia	766,917	710,330	591,732
Australia	178,563	175,959	197,328
English and Welsh	54,099	52,270	95,621
Scotch	none.	none.	3,600
Eastern (Cumberland and Anthracite)	17,319	27,370	24,133
Seattle (Washington)	250,590	240,574	165,237
Tacoma "	418,052	433,817	209,358
Mount Diablo, Coos Bay and Tesla	160,915	143,318	111,209
Japan and Rocky Mountains (by rail)	42,673	51,147	47,380
Total	1,889,128	1,834,785	1,445,598

Accidents.

I deeply regret to have to report the occurrence of 11 fatal accidents, as well as 32 accidents of a serious and slight character. Of the fatal accidents, 5 were caused by falls of rock; 4 of these befell men in their working places, of which two (both to Chinamen) were caused by their own carelessness, the other two being purely accidental. One fatality happened on the main road, and was due to a mule taking the wrong road, causing a box to jump a switch and knock out a prop and allowing the rock to fall on the deceased while he was in the box performing his duty. One fatality was due to a fall of coal on a man in his working place, through his neglecting to spragg it; and another—a gas explosion—was caused by the deceased (a Chinaman) disobeying orders. Two deaths were caused by mine cars, both being unavoidable accidents, while falling posts accounted for the two other fatalities, both of which were pure accidents.

Of the serious accidents, 3 were caused by falls of rock, and 4 by falls of coal, 6 by mine cars, 1 by a locomotive on the surface, 2 by the injured men being struck with a rope, and 1 by a rock tippler on the surface. Fifteen men suffered slight injuries, of which 2 were occasioned

by falls of rock and 1 by a fall of coal in working places; 7 were caused by gas explosion; 4 from mine cars, and 1 by powder in the mine. Particulars of all accidents appear in the detailed statement of accidents accompanying this report, and the most careful inquiry has been made in every case to find out the causes, and such measures taken as appeared necessary to prevent the recurrence of them.

I have made regular monthly examinations of all Vancouver Island mines, as required by the Coal Mines Regulation Act, and also special examinations whenever necessary.

Referring to my report for 1901, in which mention was made of the death of Thomas Nicol and two Chinamen by a fire in No. 4 slope, Union, I beg to state that the bodies of Thomas Nicol and one Chinaman were found on December 29th about 100 yards below No. 9 pump station, where it was supposed the fire originated; the other body was found later on. An investigation was made and an inquest held, the jury returning the following verdict:—

"We, the jury in the case of the inquest on the cause of the demise of the late Thomas Nicol, decide that deceased met death by suffocation by smoke in No. 4 slope mine, caused by a fire in the mine, the origin of which was not proven by the evidence.

(Signed) "ALEX. CLARKSON, *Foreman.*"

In regard to the fire in No. 2 slope, Extension, on September 30th, 1901, which caused 16 fatalities, the bodies not being recovered when my report was made for 1901, I beg to state that two bodies were found on February 24th on the brow of the slope and one near the back of No. 1 level east, on February 25th, the remaining bodies being recovered a few days later in No. 2 east level and counter, near the slope, with one exception, this being found in No. 3 level east. An inquest was held on May 3rd, 1902, and the jury returned this verdict:—

"We, the undersigned impannelled to inquire into the death of George Southcombe, find that deceased met his death by suffocation, caused by a fire in No. 2 mine. Cause of the fire we are unable to determine by the evidence. We are also of the opinion that the management are free from any blame, according to the evidence.

(Signed) "JOSEPH BLAIR, *Foreman.*"

COAL MINES OF THE NEW VANCOUVER COAL MINING AND LAND COMPANY, LIMITED.

(This Company has not authorised the publication of its Official Returns.)

The New Vancouver Coal Mining and Land Company, Limited, has been working the following mines at the Nanaimo Colliery during the year 1902, under the superintendence of Mr. Samuel M. Robins, and the management of Mr. Thomas Russell, M. E., viz.:—

No. 1 Shaft, Esplanade, in Nanaimo, Joseph Randle, Overman.
Protection Island Shaft, Thomas Mills, "
No. 5 Shaft, Southfield, Richard Gibson, "
Harewood Mine (near Extension Mine) George Bradshaw, "

The following additions and alterations have been made to the workings in the past year:

No. 1 SHAFT, ESPLANADE, NANAIMO.

The diagonal slope has been extended a short distance, and some of the levels off this have also been somewhat extended, into good coal. Work in this district is by pillar and stall and extraction of pillars. When I tested the air, in December, there were 18,500 cubic feet passing per minute, for the use of 27 men and 7 mules, the air coming down No. 1 Shaft.

The coal is hauled to the head of the diagonal slope, which is 600 yards down the main slope, by a stationary engine placed at the top of the main slope; it is then switched back on to the main slope and taken up this by an endless rope system. At a distance of 1,650 yards down the main slope a level has been driven, which forms a district of its own, and is worked by pillar and stall. At the last test made here there were 11,250 cubic feet of air per minute for 18 men and 4 mules. No. 1 Shaft is also the intake for this district.

In No. 3 North Level district the slope to the dip of the level has been extended to 530 yards, while levels have been driven off this slope and stalls laid off to the rise, in good coal. At the head of this slope is an electric winch for hauling up the coal, which afterwards is taken out to the main slope by an electric motor, and then hauled up the main slope, a distance of 600 yards, by the endless rope. There were 15,500 cubic feet of air passing per minute for 20 men and 3 mules when last tested in December, the air supply for this district coming down No. 1 shaft. All the dry parts in these workings are kept well watered by a system of pipe and hose.

The present workings in No. 1 North Level are the Big Incline, Spear's Incline and Lamb's Incline. Pillar and stall work and extraction of pillars are carried on in the Big Incline. To the right of the latter is a separate district, which received 14,250 cubic feet of air per minute for 17 men and 5 mules, when last tested. The left of this incline also forms another district and received 5,000 cubic feet of air per minute for the use of 14 men and 2 mules. Both these districts receive their air from Protection Shaft, the return being by way of No. 1 Level to the fan at No. 2 Shaft (Esplanade).

The workings in Lamb's Incline and Spear's Incline, which form one district, are by pillar and stall and extraction of pillars. The amount of air for this district was 30,000 cubic feet per minute for 39 men and 9 mules, the intake being Protection Island Shaft and the upcast Newcastle Shaft.

Protection Island Shaft.

Upper Seam.

The work in the upper seam during the year has been by pillar and stall and extraction of pillars. The main slope workings, where 50 men and 4 mules were working, were receiving 17,500 cubic feet of air per minute at my last test in December. The diagonal slope is not working at present, but there were 10,800 cubic feet of air passing per minute to keep the old workings clear.

Lower Seam.

This seam has not been worked for several months, but a supply of air, amounting to 2,550 cubic feet per minute, was passing to keep the old workings clear. This mine is watered wherever necessary. The air for Protection workings comes down Protection Shaft, the upcast being No. 2 Shaft (Esplanade), Nanaimo.

Air returned by way of No. 2 (upcast) shaft, Esplanade	149,800	cubic feet per minute.
" " Newcastle "	37,000	" "
Total air for Protection and No. 1 Shafts	186,800	" "

The total air supplied to workmen was 125,300 cubic feet per minute, which leaves 61,500 cubic feet per minute for 80 mules, roads and old workings. Two Guibal fans, one 12 x 36 feet, with 2¾-inch water gauge, at No. 1 Shaft, Nanaimo, and one at Newcastle Shaft 5 x 15 feet, with 1½-inch water gauge, are the motive power for ventilation.

No. 5 Shaft, Southfield.

In this, which is a wet mine, the work has been by extraction of pillars. At my last inspection, in December, I found 55,000 cubic feet of air passing per minute for 33 men and 5 mules. This mine is nearing completion; it is ventilated by a Murphy fan.

Harewood Mine.

The slope has been connected with the shaft sunk to the dip of the seam. The work has been level work and extraction of pillars. At my last test, August 7th, there were 6,875 cubic feet of air passing per minute for the use of 26 men and 4 mules. This is also a wet mine and was shut down in September, 1902.

COAL MINES OF THE WELLINGTON COLLIERY COMPANY, LIMITED.

(*This Company has not authorised the publication of its official returns.*)

The Wellington Colliery Company, Limited, has been operating the following mines during the year 1902, under the general management of Francis D. Little, M. E.:—

The Wellington Colliery, in Comox District; John Matthews, M. E., Manager.

The Wellington Colliery, in Cranberry District; Andrew Bryden, M. E., Manager.

The Alexandria Colliery, in Cranberry District, has been idle all the year (1902).

No. 4 Slope (Wellington), Comox.

Richard Short, Overman.

In the old slope, on the west side, which is a district of its own, the workings have been off Nos. 3, 4, 5 and 6 levels, by pillar and stall, and in good coal. When last tested there were 22,500 cubic feet of air per minute for 30 men and 3 mules. On the east side of the slope, which is another district, there were 14,500 cubic feet of air per minute for the use of 10 men and 2 mules, engaged in opening the airway and cleaning and timbering the slope.

No. 2 Slope branches off No. 1 at an angle of 45° at a distance of 75 yards from its mouth. There were 15,000 cubic feet of air passing per minute for 6 men, on the right side of the slope, at the test made in December.

No. 3 Slope branches off No. 2, also at an angle of 45°, about 500 yards from its junction with No. 1, and is down a little over a mile. Nos. 3, 4, 5, 6 and 7 levels have been driven to the right of this slope, and the work off these levels is by pillars and stalls.

Nos. 3, 4, and 5 level workings received 16,000 cubic feet of air per minute for 58 men and 5 mules, while Nos. 6 and 7 levels received 11,450 cubic feet per minute for 45 men and 4 mules. The total air in the return at the fan shaft was 104,400 cubic feet per minute, while the total air for the workings was 79,450 cubic feet per minute, leaving a leakage of 24,950 cubic feet per minute for roads and old workings. A Guibal fan, 11 x 30 feet, with 1½-inch water gauge, is the motive power for ventilation. This is a wet mine. As mentioned in last year's report, it became necessary to flood this mine to extinguish a fire, and this was accordingly done up to No. 7 level. The water is now being rapidly taken out by 8 large electric pumps, placed in the old slope and No. 2 Slope. The size of the pumps are as follows—Two 8″ x 10″, three 8″ x 8″, two 8″ x 6″, and one 10″ x 8″. Two steam pumps are placed near the mouth of the slope, one Cameron pump, 20″ x 12″ x 36″, and one Belge pump, 20″ x 9″ x 18″, for the purpose of pumping the surface water. Considerable delay has been experienced in taking the water out, owing to the slopes being very heavily caved. Three dynamos, of 50 horse-power each, have been added to the power on the surface to run the electric pumps.

No. 5 Shaft (Wellington), Comox.

David Walker, Overman.

In Nos. 1 and 2 levels, off the slope, work is by pillar and stall and extraction of pillars, in good coal. When tested in December, there were 32,500 cubic feet of air per minute passing through this district for 28 men and 4 mules. The workings in the heading are all long-wall, and there were 22,500 cubic feet of air per minute, for the use of 65 men and 9 mules, when tested in December.

The west incline, which has been in progress of being driven through a large fault for over a year, is now in a good field of coal, and will probably make a considerable increase in the output of 1903.

The total air in the return at the upcast shaft was 86,000 cubic feet per minute, the air supplied to the working-places being 55,000 cubic feet per minute, showing a leakage of 31,000 cubic feet per minute for roads, mules and abandoned workings. This is also a damp mine. A Guibal fan, 5 by 15, with 1½-inch water gauge, is the motive power for the ventilation.

No. 6 Shaft (Wellington) Comox.

Wm. Johnston, Overman.

All the workings of this mine are by long-wall. For Nos. 1, 2 and 3 levels, on the north side of No. 3 incline, there were 20,000 cubic feet of air passing per minute, for 44 men and 4 mules, when tested in December, 1902.

For Nos. 1 and 2 level workings on the south side of No. 3 incline, there were 11,700 cubic feet of air passing per minute, for 17 men and 2 mules.

Nos. 1 and 2 inclines are not working, but there were 6,000 cubic feet of air passing through to keep the workings clear.

The heading off the east lead received 10,000 cubic feet of air per minute for the use of 6 men.

The total air at the fan-drift was 96,000 cubic feet per minute, the total air supplied to working-places being 47,700 cubic feet per minute, which shows a leakage of 48,300 cubic feet per minute for roads and mule stables. The motive power for ventilation is a Guibal fan, 5 by 15, with 1½-inch water gauge. This mine is fairly damp.

No. 8 Slope (Wellington) Comox.

A new mine (No. 8) situated about 2 miles in a northerly direction from No. 4 slope, is being opened up by two slopes. A large, well-constructed pit-head has been erected, a hoisting engine put up, and the work of driving the slopes is progressing. The slopes dip 1 in 8, and will have to be driven through the surface measures (clay) to a depth of 95 feet before reaching the seam. A sample of the coal was assayed and pronounced to be of a high grade anthracite, 83 % being carbon and the percentage of ash being very low. This mine will be joined to the branch line at No. 5 pit by a railroad of 4 miles in length, which is now nearing completion.

Coke.

There are 70 ovens in actual operation at Union Bay for making coke.

No. 1 Slope, Wellington Colliery, in Cranberry District.

Alexander Bryden, Overman.

The work in this mine has been by extraction of pillars, and the mine is nearly finished. When I tested the air in December I found 50,000 cubic feet passing per minute for 18 men and 2 mules. A Murphy fan is the motive power for ventilation.

No. 2 Slope, Wellington Colliery, in Cranberry District.

David Wilson, Overman.

As mentioned in my previous report, a fire occurred in this mine on 30th September, 1901, and an attempt was made to extinguish it by putting in air-tight stoppings and expelling the air: pipes were put in through the stoppings, and thermometers fastened to a long rod were put through the pipes, to ascertain the temperature of the mine daily.

At the beginning of the year 1902 it was concluded that the mine would have to be flooded, which was accordingly done by placing a dam in the tunnel about 20 yards inside the tunnel workings towards No. 2. The dam was made of blocks of wood, the inside radius being 12 feet and the outside 20 feet. A wrought-iron pipe, 18 inches in diameter and reduced to 6 inches in diameter on the outside end, was inserted in this dam, with a valve on the end, and a pressure gauge placed on the pipe to show when the water would be high enough. The water was let in by way of the mouth of No. 2 Slope, and when the pressure on the dam reached 98 lbs. to the square inch, which was on February 23rd, 1902, it was considered that the water was high enough to have extinguished the fire. The mine was entered on February 24th by way of No. 2 Slope, and, being found clear of fire, the letting out of the water was begun. This occupied nearly a month, as they could only let it out as fast as the trough in the tunnel could carry it away, without interfering with the workings of the Tunnel mine. The mine was badly caved, and considerable time was taken up in clearing and re-timbering it.

Nos. 2, 3 and East Levels have been extended in good coal during the year, work being by pillar and stall and extraction of pillars. Three hundred and fifty yards east of where the tunnel enters No. 4 Level, a slope has been driven 200 yards to the dip, in good coal. When tested in December, there were 22,500 cubic feet of air per minute for 37 men and 5 mules in Nos. 3 and 4 Levels. In No. 2 Level, there were 42,500 cubic feet per minute for 35 men and 3 mules.

No. 4 West Level workings received 10,000 cubic feet of air per minute for 13 men and 1 mule. This mine is damp. The total air at the fan drift was 91,000 cubic feet per minute, and the total air supplied to working places was 75,000 cubic feet per minute, showing a leakage of 16,000 cubic feet per minute for roads, etc. A Guibal fan, 5 x 15 feet, with 1¼-inch water-gauge, is the motive power for ventilation.

No. 3 Slope, Wellington Colliery, in Cranberry District.

John John, Overman.

Pillar and stall and pillar work has been carried on in this mine during the year. Nos. 2 and 3 Levels on the east side of Slope, and No. 4 Level on the west side, form one district, and here 28,000 cubic feet of air per minute were supplied to 60 men and 6 mules. Nos. 2 and 3 Levels on the west side of the Slope form another district, where 58 men and 5 mules are working, receiving 17,500 cubic feet of air per minute. Nos. 2, 3 and 4 Levels on the west have been considerably extended in good coal. This mine is also damp. The total air at the fan shaft was 90,000 cubic feet per minute. The air supplied to working places was 45,500 cubic feet per minute, which shows a leakage of 44,500 cubic feet per minute for doors, roads and old workings. The motive power for the ventilation of this mine is a Guibal fan, 5 x 15 feet, with 1⅛-inch water-gauge.

The Tunnel, Wellington Colliery, Cranberry District.

James Sharp, Overman.

In No. 1 Level east, about 400 yards from the tunnel, a slope has been driven for 103 yards to the dip, in good coal. Pillar and stall work and extraction of pillars has been carried on in Nos. 1, 2 and 3 Levels east. In December, when I last tested the air, there were 14,000

cubic feet per minute for 30 men and 3 mules. On the west side pillar and stall work and extraction of pillars were carried on in No. 2 Level. Nos. 4, 6 and 8 Levels west, have been extended during the year as follows:—No. 4 to 700 yards, No. 6 to 700 yards, and No. 8 to 800 yards.

The air for Nos. 2 and 4 Levels was 20,000 cubic feet per minute for 55 men and 5 mules, while Nos. 6 and 8 Levels, where the work is by pillar and stall and extraction of pillars, received 20,000 cubic feet per minute for the use of 55 men and 5 mules. The total air supplied to the mine was 79,380 cubic feet per minute, and total air supplied to working places was 54,000 cubic feet per minute, which shows a leakage of 25,380 cubic feet per minute for roads, doors and old workings. A Murphy fan is the motive power for the ventilation of this mine.

A double track has been put in the entire length of the tunnel, meeting No. 4 Level of No. 2 Mine, along which it is continued for 350 yards east, and about 700 yards west to No. 3 Mine. It is laid with heavy rails and is substantially timbered. The coal is lowered from the workings of the different levels in the No. 2 Mine to No. 4 Level by a stationary engine on the surface at the mouth of the slope, and is then taken out along the tunnel. In the course of a few weeks the coal from No. 3 Mine will also be taken out by way of No. 2 Mine and through the tunnel.

Prospecting and Improvements.

Considerable prospecting has been done in Cranberry District by the Wellington Colliery Co., Limited, and it has proved very satisfactory.

A railway has been graded from Extension to Ladysmith, and will be completed in the coming year. It will shorten the distance by about 2½ miles and will facilitate the transportation of the coal to the shipping wharves, without using the E. & N. Railroad.

REPORT ON THE INSPECTION OF CROW'S NEST COLLIERIES.

By Archibald Dick, Inspector.

I have the honour to submit my annual report on the inspection of Crow's Nest Collieries, being a summary of the reports which have been forwarded monthly, together with the official returns from the Crow's Nest Pass Coal Company.

The Crow's Nest Pass Coal Co., Ltd.; head office at Toronto, Ont.

Officers.		Address.
Hon. Geo. A. Cox,	President,	Toronto, Ont.
Robert Jaffray,	Vice-President,	"
Lt.-Col. H. M. Pellatt,	"	"
E. R. Wood,	Secretary-Treasurer,	"
Elias Rogers,	Managing Director,	"
John H. Tonkin,	General Manager,	Fernie, B. C.
Thos. R. Stockett, Jr.,	General Superintendent,	"

Capital of Company, $3,500,000.

The above Company is now operating the following extensive collieries on the western slope of the Rocky mountains in the East Kootenay District:—

Coal Creek Collieries, situated on Coal creek, about 5 miles from town of Fernie, on the C. P. Railway.

Michel Collieries, situated on Michel creek, on the line of C. P. Railway.

Morrissey Collieries, situated on Morrissey creek and connected with the C. P. Railway and the Great Northern Railway.

In addition to operating the above producing mines, the Company is doing a lot of exploratory development work, opening up new mines in the extensive coal fields owned by it.

The output of coal shows an increase over the past year, with a small decrease in coke. The total coal produced from the Crow's Nest Pass Collieries during 1902 was 393,961 tons, an increase over the year 1901 of 14,606 tons. Of this coal, 170,460 tons were converted into coke, producing 107,837 tons, as compared with 111,683 tons in the previous year, showing a small decrease of 3,846 tons. Of this coke, 26,764 tons were sold in the United States and 81,073 tons were sold for consumption in Canada. The coal export was 101,776 tons, which also went to the United States, while 111,701 tons were sold in the Dominion of Canada, not including the coal consumed under the boilers at the collieries.

COAL CREEK COLLIERY.

Robert G. Drinnan, Manager.

This colliery, better known as "The Fernie mines," is about five miles, by a branch line, from the Canadian Pacific Crow's Nest Pass Railway. Here, in addition to the work already in progress, viz., Nos. 1, 2 and 3 tunnels, three other tunnels are now being driven into the mountain, near Fernie. One of these tunnels is in 22 feet of coal; the grading has been done and all is now ready for the rails. The track will be about one mile long, and preparations are being made to have the electric motors kept outside the mines, the intention being to use them on these mountain roads.

No. 1 Mine.

During the past year the ventilation has been greatly improved by a shaft having been put down and connected with the mine near the face. No powder is used in this mine, most of which has a very bad roof, much timber being required. As you will have seen by my reports, ventilation is good, and a plan is being prepared for its further improvement.

No. 2 Mine.

It was in this mine that the terrible explosion of the 22nd of May, 1902, took place; since then great improvements have been begun, but are not yet completed. All the roads and air-ways are being enlarged and more powerful machinery, with wire rope, has been ordered. When everything is complete the coal will be hauled from the deep by the tail-rope haulage system, and by the enlarging of the roads both the ventilation and travelling will be improved. The fan is the same, and there are steam, water-gauge and air recorders, worked by clock-work, each of them recording for 24 hours how the steam, water-gauge or air has been for the day. There is also a self-recording barometer, which registers the changes in the pressure of the atmosphere. The card of this instrument, which is replaced every Monday morning, shows the day and the hour at which any change took place. These cards are dated and filed away for future reference, if required.

The following are the official returns for the year ending 31st December, 1902:—

SALES AND OUTPUT FOR YEAR.	COAL.				COKE.			
(Tons of 2,240 lbs.)	Tons.	cwt.	Tons.	cwt.	Tons.	cwt.	Tons.	cwt.
Sold for consumption in Canada	92,309	—			52,928	—		
" export to U. S	23,641	—			25,562	—		
" " to other countries								
Total Sales			115,950	—			78,490	—
Used in making Coke	117,248	—						
" under Colliery Boilers, &c	5,578	—						
Total for Colliery Use			122,826	—				
Stocks on hand first of year								
" last of year								
Difference taken from Stock during year								
Output of Colliery for Year			238,776	—			78,490	—

NUMBER OF HANDS EMPLOYED, DAILY WAGES PAID, &C.

CHARACTER OF LABOUR.	UNDERGROUND.		ABOVE GROUND.		TOTALS.	
	No. Employed.	Average Daily Wage.	No. Employed.	Average Daily Wage.	No. Employed.	Average Daily Wage.
Supervision and Clerical Assistance	13	$3.00 to $5.50	7	$3.00 to $6.00	20	
Whites—Miners	257	3.00 to $6.00			257	
Miners' Helpers						
Labourers	150	2.50 to 3.00	71	2.00 to 2.50	221	
Mechanics & Skilled Labour	17	2.50 to 3.00	27	2.50 to 3.25	44	
Boys	14	1.00 to 1.50	5	1.00 to 1.50	19	
Japanese						
Chinese						
Indians						
Totals	451		110		561	

Statement of Employees—Average of number before and after May 22, 1902.

THE CROW'S NEST PASS COAL CO., LTD.,
THOS. R. STOCKETT, JR.,
General Superintendent.

The Minister of Mines is hereby authorised to publish these Returns.

THE CROW'S NEST PASS COAL CO., LTD.,
THOS. R. STOCKETT, JR.,
General Superintendent.

MICHEL COLLIERY.

Arthur R. Wilson, Manager.

There has been much work done here during the past year, all of which has been reported from time to time. Three mines are in operation and two others are being made ready for work. During the past year a large ventilating fan has been installed at No. 4 mine, and one is being put in at No. 5. Preparations are also being made for a very large fan at No. 8 mine, as well as a tipple and other appliances for handling the coal.

As far as I know, there has not yet been any gas seen on the north side of the C. P. R., which is where the largest mine is, but they are examined as carefully as if gas was being found.

The following are the official returns for the year ending 31st December, 1902:—

SALES AND OUTPUT FOR YEAR.	COAL.				COKE.			
(Tons of 2,240 lbs.)	Tons.	cwt.	Tons.	cwt.	Tons.	cwt.	Tons.	cwt.
Sold for consumption in Canada	15,797	—			28,145			
" export to U. S	45,158	—			1,202			
" " to other Countries	.....	....						
							29,347	
Total Sales	.....	....	60,955	—				
Used in making Coke	49,909	—						
" under Colliery Boilers, &c	2,989	—						
Total for Colliery Use	.....	....	52,898	—				
Output of Colliery for Year	.....	....	113,853	—			29,347	

NUMBER OF HANDS EMPLOYED, DAILY WAGES PAID, &C.

CHARACTER OF LABOUR.	UNDERGROUND.		ABOVE GROUND.		TOTALS.	
	No. Employed.	Average Daily Wage.	No. Employed.	Average Daily Wage.	No. Employed.	Average Daily Wage.
Supervision and Clerical Assistance	7	$3 to $5.50	6	$3 to $6	13	.....
Whites—Miners / Miners' Helpers	99	3 " 6	.....	.....	99	.....
Labourers	46	2.50 to $3	31	2 " 2.50	77	.....
Mechanics and Skilled Labour	3	2.50 " 3	14	2.50 to 3.25	17	.....
Boys	3	$1.25	.....	.....	3	.....
Japanese	.....	.....	.....	.....	.....	.....
Chinese	.....	.....	11	$1.25	11	.....
Indians	.....	.....	.....	.....	.....	.....
Totals	158	.....	62	.....	220	.....

THE CROW'S NEST PASS COAL CO., LTD.,
THOS. R. STOCKETT, JR.,
General Superintendent.

The Minister of Mines is hereby authorised to publish these Returns.

THE CROW'S NEST PASS COAL CO., LTD.,
THOS. R. STOCKETT, JR.,
General Superintendent.

MORRISSEY COLLIERY.

Charles Simister, Manager.

This mine is about four miles from the C. P. Crow's Nest Pass Railway, but the Great Northern Railway Company has a branch line from its railway system in Montana, U. S., and much of the coal from the mines goes in that direction. Mining has not been very extensive here during the past year, as there was much outside work to do and machinery to put in. Everything is now, however, being rapidly got in order, snowsheds are being put up, and it is expected that there will be a large output from this colliery, as there is plenty of coal.

The following are the official returns for the year ending 31st December, 1902 :—

Sales and Output for Year.	Coal.				Coke.			
(Tons of 2,240 lbs.)	Tons.	cwt.	Tons.	cwt.	Tons.	cwt.	Tons.	cwt.
Sold for consumption in Canada	3,595	03						
" export to U. S.	32,977	01						
" " to other Countries								
Total Sales			36,572	04				
Used in making Coke at Comox	3,303	—						
" under Colliery Boilers, &c	1,456	16						
Total for Colliery Use			4,759	16				
Output of Colliery for year			41,332					

Number of Hands Employed, Daily Wages Paid, &c.

Character of Labour.	Underground.		Above Ground.		Totals.	
	No. Employed.	Average Daily Wage.	No. Employed.	Average Daily Wage.	No. Employed.	Average Daily Wage.
Supervision and Clerical Assistance	4	$3 to $5.50	4	$3.00 to $6.00	8	
Whites—Miners	67	$3 to $6.00			67	
Miners' Helpers	66	2.50 to 2.75			66	
Labourers	19	2.50 to 3.00	21	2.00 to 2.50	40	
Mechanics and Skilled Labour			10	2.50 to 3.25	10	
Boys			2	$1.25	2	
Japanese						
Chinese			10	1.25	10	
Indians						
Totals	156		47		203	

Statement of employees covers six months during which coal was shipped.

The Crow's Nest Pass Coal Co., Ltd.,
Thos. R. Stockett, Jr.,
General Superintendent.

The Minister of Mines is hereby authorised to publish these Returns.

The Crow's Nest Pass Coal Co., Ltd.,
Thos. R. Stockett, Jr.,
General Superintendent.

COKE AND COKE OVENS.

The Crow's Nest Company carries on a very extensive business in converting part of its coal into coke. At Fernie there are 402 and at Michel 224 ovens, in addition to which excavations have been made at Michel for 200 more, and at Morrissey a long bank of ovens has been begun. There is a great demand for the Crow's Nest Coal Company's coke by all the smelting companies in Kootenay, as well as in many parts of the United States. It is the intention of the Company to push the development of its mines and enlarge its works, in order to supply the growing demand for both coal and coke, while, at the same time, the management is desirous of doing everything possible for the safety and comfort of the workmen.

ACCIDENTS IN AND ABOUT THE CROW'S NEST PASS COLLIERIES.

(*See* Table of Accidents, p. 283)

It will be observed that there have been reported from the Crow's Nest Pass Collieries 135 accidents, 128 of which were fatal. Of the fatal, 125 were due to the terrible explosion on the 22nd of May, 1902. Two were by falls of rock and the last resulted from an apparently slight accident in lifting a car.

Immediately after the disaster a full inquiry as to the cause of the explosion was ordered by the Minister of Mines, and the "Reports on the Fernie Coal Mines Explosion" has already been published by this Department.

There were 7 other accidents of a serious and slight nature reported during the year, as follows:—One by an explosion of gas on the hillside; 3 by falls of rock; 1 by a mule; 1 by falling off a car; and 1 by the fastenings giving away while getting a boiler out of the boiler-house. Nearly all these accidents could have been avoided if usual care had been taken.

I may here say that the mines of the Crow's Nest Pass Coal Company, as regards safety, are in better condition, both in travelling roads and ventilation, than they have ever been before, and I am told that it is intended to put in a system of sprayers to moisten the mine where it may be required, so that with the system of ventilation which is being followed, strict attention to airways, good discipline, as well as ordinary care in supporting the roof, and no tampering with the safety-lamps, or carrying matches in the mines, I cannot see why we should not be almost without any accidents to report.

The following were the prosecutions under the "Coal Mines Regulation Act," with sentence in each case:—

April 22nd, Wm. Edwards, smoking in Michel mine, 20 days' imprisonment.
Nov. 23rd, Eli Loyd, matches in Fernie mine, fine, $5 and costs.
" Andrew Wilkinson, matches in Fernie mine, fine, $5 and costs.
" Joseph Hunter, pipe and matches in Fernie mine, did not appear.
" Wm. Dodenski, matches in Fernie mine, did not appear.
Dec. 12th, Victor Gossano, matches in Fernie mine, fine, $5 and costs.
" Anthony Schaffer, matches in Fernie mine, fine, $10 and costs.
" Andrew Lasco, matches in Fernie mine, did not appear.
" Alex. Poloski, matches in Fernie mine, did not appear.
" John Poloski, unlocking a safety-lamp and opening it, did not appear.

The magistrate told the people in court that the next case that came before him for the same offences would get the full penalty, without the option of a fine.

ACCIDENTS IN BRITISH COLUMBIA COLLIERIES DURING 1902.

Causes of Accidents and Nature of Injury.	Colliery at which Accident Occurred.															Total for 1902.			
	Nanaimo.			Union.			Alexandria.			Extension.			Crow's Nest.						
	Fatal.	Serious.	Slight.	Fatal.	Serious.	Slight.	Fatal.	Serious.	Slight.	Fatal.	Serious.	Slight.	Fatal.	Serious.	Slight.	Fatal.	Serious.	Slight.	Total.
Explosion in Colliery (May 22nd, 1902)	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	125
Fatal	..	..	..	..	..	..	..	..	..	..	..	..	125	..	..	125	..	..	..
Explosion of Gas	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	9
Fatal	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..
Slight	..	..	4	..	..	3	..	..	..	..	..	..	..	..	1	..	..	8	..
Falls of Coal	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	6
Fatal	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..
Serious	..	1	..	..	2	..	..	..	..	..	1	..	..	..	..	..	4	..	..
Slight	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	1	..
Falls of Rock	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	15
Fatal	..	..	..	4	..	..	..	..	..	1	..	..	2	..	..	7	..	..	..
Serious	..	1	..	..	..	..	..	..	..	..	2	..	..	3	..	..	6	..	..
Slight	..	..	..	..	..	2	..	..	..	..	..	..	..	..	..	..	..	2	
From Mine Cars	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	14
Fatal	1	..	..	..	..	..	..	..	..	1	..	..	1	..	..	3	..	..	..
Serious	..	..	..	..	2	..	..	..	..	..	4	..	..	..	..	..	6	..	..
Slight	..	..	..	..	..	..	..	..	..	..	..	4	.	.	1	..	..	5	..
Powder in Mine	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1
Slight	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	1	..
Locomotive	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1
Serious	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	1	..	..
Rope	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2
Serious	..	1	..	..	1	..	..	..	..	..	..	..	..	..	..	.	2	..	..
Rock Tippler	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1
Serious	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	1	..	..
Post	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2
Fatal	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..	..	..
Miscellaneous	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2
Serious	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	1	.	.
Slight	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	1	..
Total	3	3	4	6	5	5	..	..	..	2	9	6	128	4	3	139	21	18	178

SUMMARY—TABLE SHEWING ACCIDENTS OCCURRING IN B. C. COLLIERIES IN TEN YEARS—1893 TO 1902.

For the year	1893.				1894.				1895.				1896.				1897.				1898.				1899.				1900.				1901.				1902.				Total for 10 years.			
Output of coal—tons.	978,294				1,012,953				939,654				896,222				882,854				1,135,865				1,306,324				1,590,179				1,691,557				1,641,626				12,075,528			
No. persons employed.	2,862				2,929				2,924				2,753				2,433				2,988				3,780				4,178				3,974				4,011				32,832			
Nature of Injury.																																												
Cause of Accident.	Fatal.	Serious.	Slight.	Total.	Fatal.	Serious.	Slight.	Total.	Fatal.	Serious.	Slight.	Total.	Fatal.	Serious.	Slight.	Total.	Fatal.	Serious.	Slight.	Total.	Fatal.	Serious.	Slight.	Total.	Fatal.	Serious.	Slight.	Total.	Fatal.	Serious.	Slight.	Total.	Fatal.	Serious.	Slight.	Total.	Fatal.	Serious.	Slight.	Total.	Fatal.	Serious.	Slight.	Total.
Explo'n (cause unkn'n)	..	..	..	..	.	.	..	..	..	..	..	.	..	.	..	..	..	..	..	..	..	..	..	..	..	..	.	..	..	..	..	..	64	..	..	64	125	..	..	125	189	...	...	189
Gas explosions	..	1	6	7	..	..	9	9	.	5	7	12	1	3	8	12	..	2	2	4	2	14	3	19	3	9	18	30	..	2	22	24	2	2	12	16	1	..	8	9	9	38	95	142
Falls of coal	5	7	1	13	2	7	..	9	1	4	..	5	3	4	1	8	1	3	2	6	3	4	.	7	1	4	3	8	2	14	3	19	6	9	2	17	1	4	1	6	25	60	13	98
" rock	6	6	1	13	..	8	..	8	5	13	..	18	2	8	.	10	2	7	2	11	1	5	3	9	3	5	4	12	6	15	3	24	6	8	4	18	7	6	2	15	38	81	19	138
Mine cars	1	10	..	11	..	4	1	5	2	9	..	11	1	8	..	9	3	4	..	7	1	9	3	13	3	9	4	16	4	7	3	14	3	5	5	13	3	6	5	14	21	71	21	113
" mules	..	1	..	1	..	..	..	..	..	..	..	..	..	2	..	2	..	1	..	1	..	2	..	2	..	..	..	..	..	..	..	..	...	..	..	...	...	..	..	...	...	6	...	6
" timber	..	..	..	..	1	..	..	1	..	..	..	..	..	..	..	..	..	2	..	2	..	..	..	..	..	..	..	..	..	1	1	2	...	2	..	2	2	..	..	2	3	5	1	9
Hoisting, ropes, &c	1	..	..	1	..	2	..	2	..	3	..	3	..	1	..	1	..	2	..	2	..	..	..	..	..	.	..	..	1	..	..	1	...	2	..	2	...	2	..	2	2	12	...	14
Powder, &e., explos'n	..	3	..	3	..	..	..	..	..	..	..	..	..	1	..	1	..	..	..	..	..	3	1	4	..	2	1	3	1	3	3	7	..	4	6	10	...	..	1	1	1	16	12	29
Shot	1	..	..	1	1	1	1	3	2	3	..	5	..	2	..	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3	3	...	..	..	...	...	..	..	...	4	6	4	14
On surface—miscel'n's	2	1	..	3	..	..	..	..	..	2	..	2	2	..	..	2	..	..	..	..	..	2	.	2	1	..	..	1	3	1	..	4	2	2	2	6	...	3	1	4	16	11	3	24
Fire in Mine	..	..	..	..	..	..	..	..	..	..	..	..	..	..	.	..	.	..	..	..	.	.	.	..	..	..	..	..	..	..	..	..	19	..	..	19	...	..	..	...	19	...	...	19
	16	29	8	53	4	22	11	37	10	39	7	56	9	29	9	47	6	21	6	33	7	39	10	56	11	29	30	70	17	43	38	98	102	34	31	167	139	21	18	178	321	306	168	795

DETAILED STATEMENT OF ACCIDENTS IN B. C. COLLIERIES DURING 1902.

V. I. Collieries, Reported by Thos. Morgan, Inspector.

No.	Colliery.	Date.	Name.	Occupation.	Remarks.
1	Extension....	Jan. 3rd	Geo. Keserick.	Driver.....	Collar bone broken while coupling boxes in No. 1 Slope.
2	Union	" 10th	Mah Wing....	Rope rider....	Arm broken and badly bruised about the body in No. 4 Slope, through being knocked off trip of cars.
3	"	" 14th	Mah C. Shing .	Miner	Killed in his stall in No. 5 Shaft while in the act of taking down some rock, which fell upon him.
4	"	Feb. 7th	Kusada (Jap)..	"	Leg broken and his head slightly cut by a fall of coal in his stall.
5	"	March 10th	F. Dirkes.....	"	Slightly injured on the back by a fall of rock, while working in his place in No. 6 Shaft.
6	"	" 12th	J. Hays	"	Slightly burned by gas in No. 6 Shaft.
7	Nanaimo	" 18th	John Paterson.	"	Slightly burned by gas in No. 1 Shaft.
8	Extension.....	" 31st	Wm. Simpson.	Fireman	Severely injured through locomotive on surface running off track.
9	"	May 1st	Andrew Pratz.	Runner	Slightly injured about the back through falling between the cars in No. 3 Mine.
10	"	" 2nd	J. Gichero	Miner	Slightly injured in No. 3 Mine by fall of a piece of top coal.
11	Union	" 8th	Samuel Benny.	Driver.....	Three ribs broken through being caught between the box and a post in No. 4 Slope.
12	Extension. ...	June 13th	D. Marketto ..	Runner	Slightly injured by being squeezed between two boxes in No. 3 Mine.
13	Union	" 19th	Ah Gip.....	Tracklayer..	Were slightly burned about the hands and face with gas in No. 6 Shaft.
14	"	" 19th	Ah Yet.....	Bratticeman	
15	"	" 21st	J. Ashman....	Shot-lighter ..	Slightly injured by a fall of rock in No. 6 Level in No. 4 Slope.
16	Nanaimo	" 28th	John Leach ...	Miner	Slightly burned by gas in Leach & Johnstone's stall in No. 1 Shaft.
17	"	" 28th	J. R. Johnstone	"	
18	"	" 28th	Jos. Barbori...	"	
19	Union	July 28th	Ham Fong	"	Killed in his stall in No. 5 Shaft. He was working with his partner when a piece of cap rock fell on his head and knocked his brains out. The jury brought in a verdict of accidental death.
20	Extension.....	" 28th	James Polkinghorne.	"	Slightly injured about the eyes in his stall in No. 3 Mine through explosion of powder.
21	"	" 30th	W. McAlphine	Con'r. on motor	Had his arm broken in No. 2 Mine by falling between two boxes of his trip.
22	"	Aug. 1st	J. Banayas....	Miner	Killed in No. 2 counter level east of No. 2 Slope through roof falling on him.

DETAILED STATEMENT OF ACCIDENTS IN B. C. COLLIERIES DURING 1902.—*Continued.*

No.	Colliery.	Date.	Name.	Miner.	Remarks.
23	Union	Aug. 20th	John Calverley	Driver	Killed in No. 6 Shaft by a car jumping the track and knocking out a prop, causing a stringer and some rock to fall on him.
24	Nanaimo.....	" 28th	Wm. Forrest..	Miner	Had his leg broken in Harewood Mine by fall of coal from face.
25	Extension.....	" 28th	Jos. Acquilanti	"	Leg broken by a fall of shale from the roof under which he was mining in the tunnel.
26	Nanaimo.....	Sept. 3rd	T. Cunningham	Pusher.....	Leg broken by a blow from the shackle attached to the end of rope that is used to haul the loaded cars out to the main slope from No. 3 Level (north), No. 1 Shaft.
27	Union	" 5th	Jos. Chaira....	Miner	Killed in his stall in No. 4 Slope by fall of top coal which he had neglected to spragg.
28	Extension.....	" 8th	Peter Tensz...	Timberman....	Fatally injured about the body in the Tunnel Mine by being jammed between box and post.
29	"	" 19th	R. Callander ..	Conductor.....	Arm broken on the pit head at the Tunnel Mine while playing with the rock tippler.
30	Union	" 26th	Jap	Runner.....	Leg broken by being struck with the rope while lowering a box down the stall in No. 4 Level in No. 4 Slope.
31	Nanaimo.....	Oct. 11th	Jos. Brandolini	Pusher.....	Killed in Protection Mine by being struck by a post while lowering a loaded car from the face.
32	Extension.....	" 13th	Geo. Davidson.	Motorman.....	Hand crushed while switching mine cars in the Tunnel pit-head.
33	"	" 15th	Martin Medric.	Pusher.....	Arm broken by being squeezed between two boxes in No. 3 Slope.
34	"	" 16th	John Halloran.	Rope rider....	Leg broken in No. 2 Slope through box leaving track.
35	Union	" 27th	Dom Suey	Pusher	Burned on hands and face by gas in No. 5 Shaft, through using a naked light, although provided with a safety lamp. Died ten days later.
36	Nanaimo.....	Nov. 8th	Alb. Cornfield.	Shotlighter ...	Killed on the main slope in No. 1 shaft by a runaway car.
37	Union	" 10th	On How	Loader	Killed in No. 12 stall, No. 4 level, on the heading in No. 5 shaft, by a fall of rock, he himself having knocked out the post.
38	Nanaimo.....	" 14th	Chas. Machin..	Shotlighter....	Fatally injured by being struck on the head by a falling post in No. 5 Shaft.
39	Union	" 15th	Robert Wass..	Miner.....	Leg broken by a fall of coal in his stall in No. 4 slope.
40	Extension.....	Dec. 1st	Peter Williamson..	Pusher	Slightly squeezed by a full box in the Tunnel Mine.

Detailed Statement of Accidents in B. C. Collieries during 1902—*Continued.*

No.	Colliery.	Date.	Name.	Occupation.	Remarks.
41	Nanaimo.....	Dec. 1st	Fred Goss.....	Miner	Severely injured about the back by a fall of rock in his stall in No. 1 Shaft.
42	Extension.....	" 10th	O. Massey	"	Had his shoulder broken by a fall of rock in the tunnel.
43	"	" 31st	Jos. Tate	"	Had his foot crushed by a fall of coal in No. 3 Slope.

Reported by James McGregor, Inspector of Crow's Nest Collieries.

1	.....	Feb. 20th	— Underwood.	Miner	Foot cut off by a piece of rock falling on him when at work in his stall.
2	Coal Creek....	May 22nd	Steve Morgan .	"	
3	"	" 22nd	Joe Senegala ..	"	
4	"	" 22nd	Wm. Robertson	"	
5	"	" 22nd	V. Johnston, or Johnson	"	
6	" ...	" 22nd	Jno. Leadlerate	"	
7	"	" 22nd	Geo. Altobello.	"	
8	"	" 22nd	Thos. Johnston	"	
9	" ...	" 22nd	Thos. Fairfield.	"	
10	"	" 22nd	J. R. McLeod.	"	
11	" ...	" 22nd	Frank Salter..	"	
12	"	" 22nd	W. H. Brearley	"	
13	"	" 22nd	J. Luka	"	
14	"	" 22nd	John Korman .	"	
15	"	" 22nd	Ronald Jones..	"	
16	"	" 22nd	Walter Wright	"	
17	"	" 22nd	And. Hoven ..	"	
18	"	" 22nd	Thos. Glover..	"	
19	"	" 22nd	Jas. Cartledge.	"	
20	" .. .	" 22nd	Owen Holmes..	"	
21	"	" 22nd	Wm. Ferguson.	"	
22	"	" 22nd	M. J. Fleming	"	
23	"	" 22nd	Sam'l. Hand ..	"	
24	"	" 22nd	Thos. Stevens .	"	
25	"	" 22nd	Jno. Kearney .	"	
26	"	" 22nd	Jno. Hughes ..	"	
27	"	" 22nd	J. McIntyre, Jr	"	
28	"	" 22nd	Harry Wilson .	"	
29	"	" 22nd	Geo. Housley..	"	
30	"	" 22nd	Tony Matze ..	"	
31	"	" 22nd	Wm. Neat	"	
32	"	" 22nd	Wm. McPhail.	" . ..	
33	"	" 22nd	Jan. Zelonica..	"	
34	"	" 22nd	T. Fairfield, Jr	"	
35	"	" 22nd	Jon. Velgi	"	
36	"	" 22nd	Ant. Federico.	"	
37	"	" 22nd	Jno. Walsh ...	"	
38	" ...	" 22nd	Amos Buck ...	"	
39	"	" 22nd	Joe Petras ...	"	
40	"	" 22nd	Edgar Reed...	"	
41	"	" 22nd	Jas. Flora	"	
42	"	" 22nd	Philip Chiodo .	"	
43	"	" 22nd	And. Pestorck.	"	
44	"	" 22nd	Gabriel Focca .	"	
45	"	" 22nd	Jon. Kravatz..	"	
46	"	" 22nd	Jon. Haley....	"	
47	"	" 22nd	R. McMillan ..	"	
48	"	" 22nd	H. Hawking .	"	
49	"	" 22nd	E. A. Brown..	"	
50	"	" 22nd	Geo. Rutledge.	"	

DETAILED STATEMENT OF ACCIDENTS IN B. C. COLLIERIES DURING 1902.—*Continued.*

No.	Colliery.	Date.	Name.	Occupation.	Remarks.
51	Coal Creek	May 22nd	Ablin Carlson .	Miner	
52	"	" 22nd	Wm. Love....	"	
53	"	" 22nd	Geo. Burney ..	"	
54	"	" 22nd	Jos. Landry...	"	
55	"	" 22nd	Albert Kolke..	"	
56	"	" 22nd	— Harbet.....	"	
57	"	" 22nd	H. Hartly (col.)	"	
58	"	" 22nd	Pete Lecar....	"	
59	"	" 22nd	Thos. Lecar...	"	
60	"	" 22nd	J. A. Michael .	"	
61	" ...	" 22nd	Steve Solfeak..	"	
62	"	" 22nd	Thos. Barton..	"	
63	"	" 22nd	Joe Hrubas ...	"	Killed by explosion in No. 2 Mine, Coal Creek Colliery. *See* page 274, and *see* also "Reports on Fernie Coal Mines Explosion," published by the Department of Mines.
64	"	" 22nd	Wm. Morris ..	"	
65	"	" 22nd	Jas. R. Wilson.	" ..	
66	"	" 22nd	Wm. Thorp...	"	
67	"	" 22nd	Jas. Thorp....	"	
68	"	" 22nd	Geo. Luka	"	
69	"	" 22nd	Jas. Shelling..	"	
70	"	" 22nd	Alex. Bodie...	"	
71	"	" 22nd	Steve Rosko ..	"	
72	"	" 22nd	And. Patterson	"	
73	"	" 22nd	Neta Rosseri..	"	
74	"	" 22nd	Ant. Petro....	"	
75	"	" 22nd	J. Szedroviek .	"	
76	"	" 22nd	F. Federiks ...	"	
77	"	" 22nd	Ant. Angelo...	"	
78	"	" 22nd	Mike Bakus...	"	
79	" ...	" 22nd	M. Maughney.	"	
80	"	" 22nd	S. J. Marsh...	"	
81	"	" 22nd	F. Brumansky.	"	
82	"	" 22nd	Joe Barron....	"	
83	"	" 22nd	Enoch Barron .	"	
84	"	" 22nd	A. J. Davis ...	"	
85	"	" 22nd	A. Featherstone	"	
86	"	" 22nd	Geo. Beaver...	"	
87	"	" 22nd	John Stewart .	"	
88	"	" 22nd	Geo. Beach....	"	
89	"	" 22nd	Ed. Foley.....	"	
90	"	" 22nd	Steve Belayti..	"	
91	"	" 22nd	Girardo Silla..	"	
92	"	" 22nd	Lucian Silla...	"	
93	" ...	" 22nd	Tony Angelo..	"	
94	"	" 22nd	Ant. Camarra .	"	
95	"	" 22nd	Joe Matage . .	"	
96	"	" 22nd	Ignace Matalak	"	
97	"	" 22nd	John Chingara.	"	
98	"	" 22nd	Mike Lecar ...	"	
99	"	" 22nd	Tom Kruper ..	"	
100	"	" 22nd	John Gabriel..	"	
101	"	" 22nd	Geo. Barber ..	"	
102	"	" 22nd	Philip Tabba .	"	
103	"	" 22nd	L. Armstead (c)	" .. .	
104	"	" 22nd	J. Crump (col.)	"	
105	"	" 22nd	Tony Williams.	"	
106	"	" 22nd	Dougal Milroy.	"	
107	"	" 22nd	Jas. Muir.	"	
108	"	" 22nd	Malc. McLeod.	"	
109	"	" 22nd	A. Colclough..	"	
110	"	" 22nd	T. Cavetarizo .	"	
111	"	" 22nd	Wm. Owen ...	"	
112	"	" 22nd	Ant. Mattea ..	"	
113	"	" 22nd	B. Stauchina..	"	
114	"	" 22nd	Jos. Hughes ..	"	
115	"	" 22nd	Rob. Lamb ...	"	
116	"	" 22nd	Jas. Dickson ..	"	
117	" ...	" 22nd	Jesse Wheeler.	"	

DETAILED STATEMENT OF ACCIDENTS IN B. C. COLLIERIES DURING 1902.—*Concluded.*

No.	Colliery.	Date.	Name.	Occupation.	Remarks.
118	Coal Creek....	May 22nd	W. McDonald.	Miner	
119	"	" 22nd	A. Walker (col)	"	
120	"	" 22nd	M. Fitzmaurice	"	
121	"	" 22nd	W. Marchant (Angus Gunn)	"	
122	" ...	" 22nd	John Owen....	"	
123	"	" 22nd	Ang. Federico.	"	
124	"	" 22nd	Clair Ellurfer.	Driver boss .	
125	"	" 22nd	W. J. Davis...	.....	
126	"	" 22nd	M. Kurator...	Loader	
127	"	Oct. 17th	Wm. N. Reid .	.....	Assisting to drive a mule in the No. 1 Mine, Coal Creek. The mule knocked him against a prop, when he sustained a fracture of the left collar bone.
128	Morrissey.....	Nov. 24th	Thos. Kingston	Miner	Killed by a fall of rock in the No. 3 Mine, Morrissey.
129	"	Dec. 1st	John Simon...	"	Compound fracture of the foot by fall of rock in No. 4 Mine, Morrissey.
130	"	Dec. 11th	Jos. Kipter ...	"	Back hurt through lifting an empty car on rails and died a few days later.
131	"	Aug. 2nd	Robt. Hunter .	Mech. labourer	Leg broken while helping to remove a boiler from the boiler house.
132	"	" 11th	Patrick Boyl ..	Miner	Slightly burnt about the face and hands by an explosion of gas on the hill side.
133	Coal Creek....	" 14th	Alex. Ferguson	"	Killed by a fall of rock in the No. 1 Mine, Coal Creek. This particular rock was known to be bad (or loose). Ferguson was told to go and timber it and make it secure. He omitted this for almost two days, with the result that it fell.
134	"	" 14th	John McAulay.	"	Seriously injured through fall of same rock.
135	"	Oct. 14th	Mike Sackaco .	Driver	Dislocated right shoulder by falling from water car.

REPORT

OF THE

Special Commission appointed to inquire into the Causes of Explosions in Coal Mines.

———o———

To His Honour the Honourable SIR HENRI GUSTAVE JOLY DE LOTBINIÈRE, *Lieutenant-Governor of British Columbia:*

SIR,—On the 7th day of August, A. D. 1902, a Commission issued to us under the provisions of the "Public Inquiries Act," to inquire into and obtain information respecting the causes of explosions in Coal Mines and the means that should be adopted to avoid such explosions; and pursuant to the requirements of the Act we have the honour to report as follows :—

At a preliminary meeting it was arranged that Mr. Lampman, in addition to his duties as Commissioner, should also act as Secretary to the Commissioners, and pursuant to section 9 of the "Public Inquiries Act," Mr. L. J. Seymour was appointed stenographer to the Commission and reported the evidence taken at the different sittings.

Notice of the Commissioners' first sitting was advertised in the British Columbia Gazette of 28th August, 1902, and in the Fernie "Press."

Before the sitting in Ladysmith, notice was advertised in the Ladysmith "Leader," and before the sitting in Nanaimo, in the Nanaimo "Free Press." Owing to uncertainty as to the exact time of our sitting in Cumberland, and to the fact that the newspaper there is a weekly one, notice was not advertised there, except by the posting of notices in conspicuous places around the town.

Your Commissioners first visited Fernie, arriving there on Saturday, the 6th September, 1902. The Commission was formally opened on Monday the 8th, the secretary reading the Commission, after which the chairman stated its objects. After going through the mines at Coal Creek, Michel and Morrissey, we proceeded with the examination of witnesses, of whom 22 appeared and were examined, consisting of 1 mine inspector, 2 mine managers, 4 overmen, 4 firemen and 11 miners.

Cumberland was the next place visited, where some of the mines were gone through and 20 witnesses examined, of whom there were 1 mine inspector, 1 mining engineer and manager, 1 mine manager, 3 overmen, 1 shotlighter, 1 timberman and 12 miners.

We next went to Ladysmith, where the evidence was taken of 22 witnesses, of whom there were 1 mine manager, 2 overmen, 8 firemen and 11 miners.

Nanaimo was visited last, and during 8 days there 25 witnesses appeared and gave evidence; the witnesses consisting of 1 mining engineer, 1 mine manager, 1 mine surveyor, 1 mechanical engineer, 2 overmen, 1 mining instructor, 6 firemen and 11 miners. In addition to these the manager of the Hamilton Powder Company's works, at Northfield, gave evidence, and Inspector Morgan, who had already been examined at Cumberland, was re-called.

Many of the witnesses who have been classed as overmen hold managers' certificates, and many who have been classed as firemen hold overmen's or managers' certificates, the classification being given according to the position the witnesses held at the time.

While at each of the last three places visits were made to some of the mines.

At all of the mines both the officials and the miners entered into the spirit of the inquiry and afforded us every facility in making a personal examination of the mines and getting evidence.

Your Commissioners in making their report think the most convenient arrangement will be to deal with the different matters on which evidence was given under different headings, as follows :—

VENTILATION.

The question of ventilation is probably the most important in connection with coal mining, for two reasons : first, because it is imperative to have a sufficient supply of pure air to insure the health of the workmen ; and second, because the volume should be such as to sweep away any gases, whether explosive or not, which may be given off from the workings. This is provided for by Rules 1 and 2, section 82 of the Act.

With the mechanical appliances now in use in the various coal mines of the Province, there is no reason why a supply sufficient for all purposes should not be passed through the workings, providing proper attention is paid to the intake and return airways and the law relating to splits is carried out ; and here we may mention that from the evidence given before us, it appears that the provisions of Rule 68 of the special rules, forbidding the deposit of obstructions and rubbish in the air-courses and roads, do not meet with the strict observance their necessity calls for.

At some of the collieries visited by your Commissioners the sectional area of the airways was rather contracted for efficient service, but we were pleased to note that extensive operations were then in progress to remedy this defect. We cannot depreciate too strongly the dangerous practice of opening up what may become an extensive colliery with narrow and contracted intake and return airways.

In an intake airway of insufficient area it is impossible to pass a volume of air in such quantities as to insure safety without increasing the velocity to such an extent as to become, in a dry and dusty mine, a source of danger.

In extensive mines where mechanical haulage is employed, it would vastly improve the system of ventilation if the intake airway was divided into two parallel drifts, or some other means adopted whereby there would be an intake airway independent of the main haulage way, and especially where electric motors are used, as the motors and the train of loaded cars almost fill the area of the roadway, and when going at a high rate of speed very materially obstruct the free passage of the air currents.

In this connection it may be well to state that care should be exercised in having good airtight stoppings between the main intake and return airways, so that the quantity of air may not be reduced before reaching the working faces.

In at least one place visited we found the pillar of the main intake frequently perforated with openings or cross-cuts from what was practically the old workings. This was not only a source of danger, but it would be almost impossible to conduct the air current without material leakage. We would recommend that between main intake and return airways cross-cuttings should be as far apart as possible.

There is another point which we deem of sufficient importance to recommend its being made part of the Act, and that is that the intake and return air pass through different mine openings ; in other words, that a certain distance of natural strata shall intervene between the intake and return. Probably the intention of section 24 was to meet this requirement, but mines are operated where the intake and return air currents are divided only by a board partition in the shaft. The Act should be clear on this point.

As furnaces are not now used nor likely to be used in this Province, it is not necessary to say anything in reference to them. Fans are universally used, many of them of the most modern pattern, and in every instance where permanently placed the usual precaution is taken to prevent injury in case of an explosion. It would be conducive to the safety of mines if there were two fans, so that in case of injury to one the other would be available. This would be desirable at all mines, but in the case of fiery mines we consider it very necessary.

Where the two fans are not considered absolutely necessary there should be two engines, each capable of working the fan on opposite sides.

Dust.

It is now generally admitted that coal dust is explosive even in the absence of gas, and, consequently, a source of danger, and nearly every witness seemed thoroughly alive to the importance of watering as a preventative of an explosion.

The origin and conditions of a fire-damp explosion have for a long time been matters of general knowledge amongst miners, but the dangers of coal dust are of more recent discovery. That fire-damp is not an essential element of an explosion is evidenced by the fact that an explosion occurred in November, 1893, at the Camerton collieries, Somersetshire, England, in a mine altogether free from fire-damp. Similar explosions have occurred, such as at Timsbury and Pocahontas.

The evidence taken was to the effect that a system of watering dusty mines was necessary and should be made compulsory, but there was some diversity of opinion as to the best system. There was, however, practically a unanimity of opinion that watering by buckets is almost sure to be inefficient, and in this regard we entirely agree with the remarks of Mr. J. S. Martin, one of His Majesty's Inspectors of Mines, who, in reporting to the Secretary of State for the Home Department on the circumstances attending an explosion which occurred at Llanbradach Colliery, Llanbradach, near Cardiff, on the 10th of September, 1901, used the following language:—

"The method of watering by barrels is in use very extensively in the district and has been maintained to be satisfactory, the water being distributed by flexible pipes attached to the barrel, or by buckets. It is a system which would allow of the places being thoroughly watered, but it has never presented itself to me as altogether satisfactory, owing to the human element in the arrangement which seemed likely to render what was 'possible,' 'not probable.' I have, however, always been told that the watering was done thoroughly whenever I raised the question, casually, upon making inspection at mines. There no longer seems any ground for considering it satisfactory, and I think colliery managers and workmen must in the future more thoroughly recognise the danger arising from dust, and introduce some satisfactory means for bringing a jet of water to play upon the roof and sides. Where the water has to be conveyed in barrels or tanks, they must see that a much greater supply is provided, and that some kind of hand pump is used for applying it. It must also be borne in mind that where there is much dust, water takes little effect at first, and that it must be very liberally distributed for its use to be efficient."

Professor Galloway, an eminent authority on coal dust explosions, specifies five systems of watering mines, namely:—

(1.) Water tanks hauled along the mine railways, provided with a pipe pierced with holes;

(2.) Sprays produced from very small nozzles fixed to vertical stand pipes fixed to a water pipe laid along one side of the haulage way;

(3.) Similar sprays in which compressed air is employed for the purpose of pounding the water into very fine particles;

(4.) A water hose, 30 or 40 feet long, attached at one end of a short stand pipe connected to a water pipe lying along the road;

(5.) The exhaust steam of a constantly working engine, such as the engine of a ventilating fan, introduced into the intake air as it descends the downcast shaft.

Of the different systems, most of the witnesses preferred the sprays as mentioned in clause two, and from our personal observation and from the evidence given before us there seems no reason why such a system should not be adopted without causing any injurious effect to the roadways.

In addition to the foregoing systems, which seem to deal principally with the watering of main roads, it is imperative that the system adopted should be continued so that the water is carried to and around the working faces, as it is there the great danger arises, owing to the use of explosives. It is at the working faces that a mixture of fire-damp and coal dust in suspension is most likely to be met with, and authorities are agreed, after a series of experiments and demonstrations, that a small percentage of fire-damp, say 2 per cent. or even less, which of itself is harmless, may, with coal dust in suspension, become highly explosive and especially dangerous in the case of a blown-out shot.

It is conceded that all coal dust is not explosive, but we have every reason to believe that at all the collieries in this Province the dust, under certain conditions, is of an explosive nature. The experiments made by your Commissioners were of the crudest character, yet they were sufficient to prove that dry dust will easily ignite.

It is impossible to prevent entirely the accumulation of dust, but a great deal could be done to prevent the danger arising from its accumulation; for instance, the cars, as far as possible, should be dust-proof, and personal observation convinced us there was room for improvement in this direction. In some places in Great Britain, as an extra precaution, they are watering the full trains before they start on their journey to the surface.

Explosives.

The use of explosives in coal mines deserves the most careful attention. The ordinary black blasting powder now in use is generally admitted to be dangerous under certain conditions. In the coal fields of British Columbia an explosive of some kind is necessary. Where safety lamps are required the use of black powder should be prohibited. The many contrivances invented for getting coal, such as the lime cartridge, compressed air cartridge, the wedge, etc., would be useless, owing to the nature of the coal seams. It therefore follows that where black powder is prohibited some substitute must be adopted. The Government of Great Britain have adopted what is known as a permitted list of explosives, a system which we strongly recommend be introduced in this Province.

Evidence was given showing that there was a difference in the strength of explosives now in use, although sold as of the same grade, and for this reason a danger; therefore, we believe there should be Government inspection or supervision of all explosives used in coal mines, and the composition and date of manufacture marked or stamped on the keg, case, cartridge or package, as the case may be.

We believe that Rule 9 of section 82, respecting the carrying and storing of explosives, and especially dynamite, is not rigidly observed. This explosive should be taken into the mine in a protected case only, and never when in a frozen condition. It should be wrapped so as to protect it from freezing after being brought in. Thawing in the mine should be strictly prohibited, unless proper appliances are provided for that purpose.

BLASTING.

Blasting is, no doubt, the greatest danger to be contended with in coal mining. Probably most explosions can be traced to the agency of blown-out shots, and for this reason every precaution should be exercised to prevent their occurrence. It is established beyond doubt that in a mine of a dry and dusty nature a blown-out shot is liable to create an explosion even where no fire-damp exists. This danger is now fully recognised amongst the miners themselves, as their evidence shows. For the purpose of carrying out the rules governing blasting the shot-lighter should be a thoroughly competent and reliable official. He should see that the coal is well prepared and the shots properly placed; that the boreholes are well cleaned; he should examine the quality and quantity of explosives used; he should see that coal or coal dust is not used in the tamping and that the augers used in boring are as nearly of a uniform size as possible.

The method and quality of tamping are very important, and some suggested that only a clay or a suitable shale should be used for that purpose, and none of the witnesses could remember of having had a blown-out hole with clay tamping.

He should see that sub-section (1*b*) of Rule 9 of section 82, in relation to the watering of the place, is fully carried out, and refuse to fire shots unless the suggested precautions are observed.

We recommend that the Act should be made clear so as to provide that all holes should be examined by the shot-lighter before charged, and that the place should also be examined by him after the shot had been fired, as blowers of gas may have been liberated and the ventilation interrupted by the shot. The great majority of witnesses were of opinion that this would add to the safety of the mine. It is true some objected to it, but we think their objections were based on a not unnatural desire to be unmolested in their work.

In mines where safety lamps are considered necessary the shot-lighters should be provided with some sort of shot-firing lamp. The present system of opening the lamp to light squibs or fuses is not conducive to safety and should be prohibited. Of course it is understood that the fire-man or shot-lighter will not open his lamp unless he knows there is no gas present, but the practice has a tendency to make miners less careful in exposing a naked light, as when a miner sees an official opening a lamp for this purpose he might conclude, with some reason, that there would be no harm in his lighting a pipe and smoking. To obviate this danger, we would recommend that shots be fired by electricity. The evidence was practicially unanimous that where safety lamps were necessary, nothing but explosives of a permitted list should be used.

In the use of explosives in leading places extra precautions should be taken, and we cannot emphasise too strongly the necessity of only men of acknowledged skill and experience being employed at such work.

ELECTRIC APPLIANCES.

In a dry and dusty mine, giving off gas to such an extent that safety lamps are necessary, electric appliances, such as motors, hoists and pumps, should be prohibited. Exceptions might be made in the main intake airways, but in no cases should such appliances be used in the return airway of a mine giving off inflammable gas. This is not only the opinion of your Commissioners, but the evidence given was almost unanimously to the same effect.

FIREMEN.

In mines giving off gas, it is highly essential that the examination of the working faces, roads and airways, should be thorough and frequent, and for this purpose the Act, in our opinion, is not sufficient. Rule 3 of section 82 provides that in a mine in which inflammable

gas has been found within 12 months, an examination shall be made before the time for commencing work. The evidence showed at some mines that this was construed so as to permit of such examination as much as 7 hours or more before the workmen entered the working places.

We, therefore, recommend that the rule should provide that the examination should be made not more than 2½ hours before the time of the workmen entering, and less where deemed necessary. The rule should be applicable to all coal mines in the Province, irrespectively as to whether or not inflammable gas has been found within the preceding 12 months. It should be an offence against the Act for a fireman, or anyone else, to attempt to remove a body of gas of any quantity by any means other than ventilation.

To fully carry out the onerous duties of fireman, it is necessary that he should be free from physical disabilities, and it is especially necessary that his eyesight should be good, and for this reason we would recommend that the amendment to the Act (1901) governing the examinations be amended so that firemen and shot-lighters, before being granted certificates of competency, be required to furnish the examiners with a certificate from a competent person that their eyesight is in good condition.

It is claimed by authorities that with the lamp now in use by firemen it requires a practised eye to detect two per cent. of gas. This would lead to the inference that a greater percentage would go undetected by a fireman with defective sight. While two per cent. of gas in the atmosphere may not be considered dangerous, it is acknowledged that if, in addition, there is dust in suspension, the danger point is reached in the event of a blown-out shot.

Under this head we wish to say that it is full time a lamp of a more modern pattern, and one that will detect a smaller percentage of gas, be furnished by mine-owners for the use of firemen. There are several such lamps on the market, and it is claimed for them that they will detect as low as one-quarter of one per cent. of gas.

In addition to this, gas-testers of acknowledged efficiency should be kept at the colliery, for the use of the Manager and the Inspector, by which frequent tests could be made in the return airway and the results noted and recorded in the fireman's report book. We also think the fireman's lamp should be furnished with a re-lighting apparatus, so that in case of the light being extinguished the lamp could be re-lighted without being opened.

The present practice of firemen in making their examinations is to carry an unlocked lamp, and in case of their lights going out to open the lamp and re-light with a match. This is a dangerous practice and should be prohibited.

The intention of Rule 3, section 82, would appear to prohibit the allowing of miners or others to work at the faces where inflammable gas is found. It would not be complying with the spirit of the Act and the rule to allow work in such places, even though safety-lamps are used. We have reason for believing that Special Rule 33 is not always strictly observed, and as it is very important for the general safety of the mine that the rule should be strictly observed, the Mining Inspector should make special inquiry as to this and enforce the rule.

Safety-Lamps.

There was a great diversity of opinion as to the merits of the different lamps, about which your Commissioners have nothing to say, except that they do not find that any of the various kinds of lamps now in use in the Province can be classed as unsafe. In the cleaning and trimming of the lamps great care should be exercised, as otherwise a miner may take into the mine a lamp in a defective condition. We recommend that all safety lamps be tested in an explosive mixture before being given out to the workmen.

Doubtless there would be fewer accidents from fire-damp explosions in this Province if safety-lamps were entirely used, but the accidents from other causes would inevitably be

increased to such an extent that we hesitate to recommend their exclusive use. We see no reason why, with an adequate supply of air properly conducted around the working faces, thorough examinations and supervision by the mine officials, discipline on the part of the workmen strictly enforced, safety explosives only used, roads and airways and working faces kept in a moist condition, that open lights could not be used with comparative safety.

Working more than One Shift.

The working more than one eight-hour shift in every twenty-four hours has received considerable consideration. The consensus of opinion was against three shifts under any conditions, except, possibly, in leading places. There was some diversity of opinion as to whether a second shift would create any additional danger, but, on the whole, there was but little objection to the second shift, provided the mine was well watered and ventilated. In mines, however, giving off large quantities of inflammable gas, and where the coal is of a soft and friable nature, the working of two shifts in succession may be a source of danger. In cases of this kind, of which the Inspector should be the judge, and where it is found necessary to work two shifts, we would recommend that some mutual understanding be arrived at between the workmen and the management so as to allow an interval of some hours to elapse between shifts.

Panel System.

Where the panel system of mining can be adopted it would undoubtedly add to the safety of the mines, and with the suggested precautions should render us practically free from these disastrous explosions unfortunately so frequent in our coal fields. We are aware that the coal fields of this Province are broken, and in some cases the system would be almost impossible, but in many places it could be worked to advantage. The advantage of this system is that it does away with the necessity of so many doors in conducting the ventilating current. Doors on main roads and important haulage ways must be considered a source of danger, and the aim should be to have as few as possible.

Old and Abandoned Workings.

What are known as old and abandoned workings must always remain a source of trouble to mine managers, and the question as to the best remedy to overcome the trouble and remove the danger is as yet an open one. The great majority of the witnesses were in favour of rendering old workings harmless by having sufficient ventilation passing through them; but while this view cannot be combatted, the fact yet remains that in many cases it is almost impossible to carry it out, owing to caves and falls obstructing the airways. The only recommendation we can make on this head is that, where possible, the ventilating process should be used, otherwise secure and airtight stoppings should be erected.

Stoppings.

On the question of stoppings a diversity of opinion existed amongst the witnesses, some maintaining that they should be built of stone, others that they should be of brick, but probably the majority were in favour of wooden blocks. While not expressing an opinion as to which is the best, we may point out that anyone of the different kinds mentioned would meet all requirements if properly constructed. It is yet an open question whether all stoppings should be built so as to be explosion proof or not.

Examinations.

A mine cannot be considered safe unless the officials and workmen are practical and competent, and to insure a greater efficiency in this respect we recommend some changes in the existing regulations. At present a candidate for a mine manager's certificate is required to

have had only two years' experience in or around a mine; it is not required by the Act, but is a rule of the examiners. This time is quite inadequate, and all are agreed that it should be extended, and that the change should be embodied in the Act, and we recommend that the required experience in and around coal mines be five years.

We also wish to point out that all are agreed that men cannot with only one year's experience become qualified to act as overmen, firemen and shot-lighters, and we recommend that a certificate of competency as overman be not granted to anyone who has had less than five years' experience, and that a certificate of competency as shot-lighter or fireman be not granted to anyone who has had less than three years' experience.

We also recommend that overmen and firemen should be examined by the same Board of Examiners as the Manager; at present the Board contains two miners, and we share the opinion of the miners generally that no official should be examined by another official of a lower standing.

There is a prevailing opinion that the class of labour employed in the mines of this Province may have had something to do with the high rate of accidents. Whether the theory is a correct one or not we are unable to positively state, but there can be no division of opinion that an intelligent class of labour is in every way preferable.

British Columbia is handicapped, owing to the scarcity of skilled miners, differing in this respect from old mining countries where most of the miners have had experience since boyhood.

Many witnesses went as far as to say that all employees in a coal mine should be able to read and write in the English language. However that may be, we have no hesitation in recommending that the late amendment to the Act governing the examination of miners and others be amended so as to require that all the employees in the mine be able to intelligently understand orders given in English. There is a rule in the Special Regulations for the working of coal mines in the Kingdom of Prussia which might well be embodied in the Special Rules of this Province. It is as follows:—

"Care must be taken that workmen who cannot read are instructed as to regulations pertaining to their labours. The mine owner or his representative is responsible for the execution of this regulation."

Section 42 of the Act provides for the cancellation or suspension of the certificate of a mine manager if it is deemed he is unfit to discharge his duty by reason of incompetence or gross negligence, or of his having been convicted of an offence against the Act, but there is no corresponding provision whereby the certificates of overmen, firemen, shot-lighters or miners may be suspended or cancelled. The provision should extend to all having certificates, for at present a man might be convicted of some act endangering the lives of those in the mine, but it would still be open to him to obtain employment at another colliery, on production of his certificate of competency. A man too careless for one mine will likely carry his careless habits with him to another.

Discipline.

Even where every appliance is available it is important that strict discipline be observed amongst both officials and workmen. The official that is not amenable to discipline himself, or cannot maintain it amongst those under him, should have no place in a coal mine. The trapper boy, by disobeying an order, may be the cause of a disastrous explosion. It follows that it is important that all should have sufficient intelligence to fully understand orders and instructions, and that they should be impressed with the necessity of strict obedience. To

enforce the Rules and Regulations it should not be left entirely with the officials and the Inspector, but each individual should be a watch on his neighbour and report to the management any violation of the Rules.

CONCLUDING OBSERVATIONS.

It is often exceedingly difficult to determine the cause of an explosion, the evidence of experts being often so conflicting both as to the cause and the initial point.

The conditions which render a mine dangerous may be summarised as follows:—

The atmosphere gradually becoming saturated with inflammable gas; sudden outbursts of gas; and dry and dusty roadways, working faces and air passages.

The causes which would create an explosion where these conditions exist are naked lights; defective safety lamps; flame from shots; concussion from blown-out shots or volley firing; accidental ignition of explosives; and lightning entering the mine.

While it is generally conceded that the coal mines of British Columbia generate inflammable gas, yet the investigations into the different explosions which have taken place in the past point to the fact that coal dust, and not fire-damp, was the main factor in these catastrophes. With possibly one exception, the mines were working as usual, and, according to the reports of the firemen, were practically free from gas; the evidence showed that watering had been done in compliance with the Rule in the Act governing the same, yet a dangerous condition must have existed or the explosions would not have occurred. This shows that the precautions heretofore taken have been inadequate; but even where all precautions are taken it is doubtful if we can ever become entirely free from explosions, and for this reason there are some appliances which we recommend should be provided so that they may be used in case of accident. Instances are on record of where lives might have been saved if the victims of an explosion had been conversant with the avenues of escape; there are also instances of cases in which if a light could have been obtained, such as that supplied by the re-lighting attachment of some safety-lamps, it would have aided in saving life. Some of the workmen in each section of the workings should periodically be instructed in the means of escape. Material for quickly replacing stoppings and respirators or other contrivances for entering foul atmosphere should be kept on hand.

The fatalities from explosions and other causes in the mines of this Province have been extremely high, as the following statement prepared for us by Inspector Morgan shows:—

"*Number of fatalities for every 1,000,000 tons of coal produced in Great Britain, Pennsylvania and British Columbia for ten years.*

"In Great Britain, for ten years, 1890 to 1899, inclusive, there were 2,032,810,544 tons of coal produced. During this period there were 9,036 fatal accidents, 1,269 being caused by explosions and 7,767 by other causes, showing that for every 1,000,000 tons of coal there were .624 fatalities from explosions and 3.328 deaths from other causes.

"In the State of Pennsylvania, according to the report of the Bureau of Mines, Harrisburg, Pa., the amount of coal produced was 1,132,396,728 tons for the years 1892 to 1901, inclusive, a period of ten years, while during this time 5,713 fatal accidents occurred, 470 being caused by explosions and 5,243 by other causes, so that for every 1,000,000 tons of coal produced there were .415 fatalities from explosions and 4.63 deaths from other causes.

"In the Province of British Columbia, for the period of ten years, 1892 to 1901, inclusive, there were 188 fatalities, while the amount of coal produced was 10,878,427 tons. Out of the 188 fatalities, 72 were caused by explosions and 116 by other causes. There were 6.618 deaths by explosions for every 1,000,000 tons of coal, and 10.663 fatalities from other causes for the same amount of coal."

These figures disclose the fact that the fatalities in British Columbia from causes other than explosions were almost double those caused by explosions, thus shewing that explosions are not the only dangers to be contended with.

In the following paragraphs we give a summary of the most important subjects dealt with in our report and the recommendations based on them :—

Ample ventilation in moderate velocity to sweep roadways and working faces.

Copious watering of all working places and roadways, where necessaay.

Explosives similar to those on the permitted list in Great Britain only to be used, except in mines or parts of mines naturally wet and free from fire-damp.

Government inspection of all explosives used in coal mines.

Shots to be fired by official shot-lighters and then only when well prepared and properly placed.

Shots to be tamped with clay, suitable shale or some other non-inflammable material and fired electrically.

Prohibition of volley firing in stone drifts or other places connected with a dry and dusty mine.

In work involving extra risk and responsibility, only the most competent and reliable workmen to be employed.

Exclusion of all workmen from the mines who cannot intelligently understand orders and instructions given in the English language.

Strict enforcement of all Rules and Regulations, with rigid discipline generally.

Systematic inspections of each mine by the workmen, as provided for by Rule 31 of section 82 of the Act.

All of which is respectfully submitted.

We have the honour to be,
Sir,
Your obedient servants,

John Bryden.
Tully Boyce.
P. S. Lampman.

Victoria, 18th February, 1903.

LIST OF CROWN-GRANTED MINERAL CLAIMS.

CROWN GRANTS ISSUED IN 1902.

CASSIAR.

Name of Claim.	Division.	Name of Grantee.	Lot No.	Acres.	Date.
Lakeview	Atlin	Gleaner M. & M. Co., Ltd.	241	32.05	Jan. 14
Mysotis	"	" "	239	45.03	" 14
Taku Chief	"	" "	240	39.05	" 14
War Eagle	"	C. Christopher	187	42.28	Dec. 4

CARIBOO.

Adventure	Cariboo	S. Winter	511	51.65	Nov. 27
Boulder	"	Wm. Christie, S. Winter, *et al*	512	51.65	" 27
Bonanza	"	S. Winter	516	51.65	" 27
Dreadnot	"	W. Christie, S. Winter, *et al*	514	51.07	" 27
Mammoth	"	" " "	513	51.65	" 27
Minnie Smith	"	S. Winter	510	51.65	" 27
Premier	"	"	515	51.65	" 27

WEST KOOTENAY.

Accidental	Slocan City	V. & M. Mines, Ltd	4258	31.81	Feb. 14
Amen	Trail Creek	Umatilla Gold Mining Co., Ltd	4246	32.60	" 18
Apeax	Nelson	J. J. Malone & T. George Roy	5032	51.65	" 19
Agnes	Trail Creek	Peter Kennedy & Robert Lamont	5214	48.24	March 14
American Eagle	Slocan City	The Slocan-Republic Mg. & Dev. Co., Ltd	5499	34.14	April 23
Algoma	Arrow Lake	The Mount Sicker & B. C. Dev. Co., Ltd	5598	51.65	" 30
Ajax	Revelstoke	Great Western Mines, Ltd. Liability	4925	51.65	July 7
Acme	Trail Creek	Andrew D. Provand	2947	44.81	" 14
Annie Fractional	Nelson	The Dundee Gold Mining Co., Ltd. Liability	3849	11.30	" 15
Armor Plate	"	Richard Dalby Morkill	4186	43.59	" 22
Alpha No. 2 Frac.	Ainsworth	William Fovurque Whellams	5819	.70	Aug. 15
Anne	Nelson	Rupert Eugene Arthur Mueller	5380	51.65	Sept. 2
August Flower	Slocan	John D. McMaster	4865	28.90	" 9
Arnold	Nelson	William Ashness Arnold	4079	51.65	" 15
Arlington No. 1 Fr.	Slocan	Arlington Mines Ltd. (Non-personal lia.)	2356	10.80	Oct. 30
Alma	Nelson	Samuel S. Fowler	2162	42.37	" 6
Alexandria	"	"	2165	38.75	" 6
American Flag	Goat River	Thomas G. Shaughnessey, *et al*	5767	51.54	" 8
Atlantic	"	"	5785	29.19	" 8
Agnes	"	"	5790	51.65	" 8
American Flag Fr.	Kettle River	"	5770	25.32	" 8
Annie Maud	Nelson	Duncan McArthur	4210	33.85	Nov. 18
Abbacorne Fraction	Trail Creek	George H. Suckling	1860	7.43	" 27
Black Diamond No 1	Ainsworth	Silver Tip Mining Co., Ltd.	4286	26.27	Jan. 24
Black Diamond No 2	"	"	4287	33.88	" 24
Black Diamond Fr.	"	"	4291	45.70	" 24
Brooklyn	"	"	4292	15.18	" 24
Blackfoot	Trail Creek	Umatilla Gold Mining Co., Ltd	4243	51.65	Feb. 18
Bannock	"	"	4245	50	" 18
Blue Bird	Nelson	Montana Gold Mining Company	5438	47.68	March 7

WEST KOOTENAY.—*Continued.*

Name of Claim.	Division.	Name of Grantee.	Lot No.	Acres.	Date.
Boston	Ainsworth	Wallace Weaver Berridge	4913	41.20	March 20
Black Diamond	Nelson	John Dean	3413	41.05	April 9
Bonanza No. 3	Slocan City	The Slocan-Republic Mg. & Dev. Co., Ltd.	5497	49.69	" 23
Bell No. 2	"	" "	5500	49.08	" 23
Baby Royal	"	Fred. Green Carlisle	5508	44.73	June 18
Big Elephant	Trail Creek	John Kuhn	5428	34	" 24
Black Bess No. 3	Slocan City	George Brine	3263	35.50	July 7
Black Diamond	Lardeau	The Double Eagle Mining & Dev. Co.	5689	51.52	" 9
Bendigo Fraction	Slocan	William C. Yawkey & Nellie Hickey	3741	2.28	" 22
Benbow	"	" " "	4551	46.69	" 22
Big Kanawha	"	" " "	4550	18.76	" 22
Baby Fraction	"	Jacob Kelsen	5542	27.40	" 26
Black Horse	"	Charles E. Hope	5016	48.01	Oct. 3
Bunker Hill	Nelson	Wm. Griffith & Thos. A. Cameron	4923	51.58	" 6
Burlington Fraction	"	John A. Turner *et al*	1079	15.50	" 9
Bonanza	Lardeau	Angus McKay *et al*	5661	17.45	Nov. 7
Bon Accord	Trail Creek	John Stilwell Clute, Jr	1878	51.06	" 11
Big Four	Nelson	The British Lion G. Mg. & Dev. Co	5619	48.49	" 12
Blackbird	Slocan	Wm. C. McLean *et al*	4180	31.18	" 26
Bendigo	"	Wm. C. Yawkey	3740	31.70	" 26
Bunker Hill	Ainsworth	James D. Warren	5827	33.10	Dec. 9
Cariboo	Nelson	Wm. Richardson Will	5265	30.70	Jan. 15
Capello	Slocan	W. R. Will	4527	8.74	" 27
Central	"	R. G. Henderson	2415	2.92	Feb. 15
Condore	"	Fred. A. Henneberg *et al*	5615	43.89	" 18
Corless Fraction	"	" "	5616	10.04	" 18
Carthage	Nelson	Henry Kearns	2197	49.76	" 18
Cliff No. 1 Fraction	Trail Creek	Harry Daniel *et al*	5010	7.97	" 19
Curfew	Nelson	John J. Malone	5034	51.65	" 19
Crow Fractional	Slocan	Robert Insinger	3365	6.50	March 12
Champion	Nelson	Henry S. Crotty	2912	40.59	April 26
Crawford Fractional	Slocan	Urban Mining Co	5197	19.45	May 6
Cuba	Ainsworth	Hugh B. Fletcher *et al*	5609	16.30	June 11
Connie Frac. No. 2	"	" "	5818	50.70	" 11
Copper King	Nelson	K. D. Green & J. Bernard	5153	28.95	" 19
Copper Queen	Ainsworth	True Blue Copper Mines	4861	51.65	July 10
Chambers	Slocan	Louise Berens *et al*	1752	17.63	" 17
Cashier	"	John Keen	5751	20.85	Aug. 25
Cuba No. 2	Ainsworth	W. W. Bridgman	4914	49.88	" 25
Cornecracker Fract	Slocan	N. W. Mining Syndicate, Ltd	4854	10.58	" 27
Canadian Girl	Trout Lake	R. N. Northey *et al*	4705	51.65	" 28
Crown Point	Ainsworth	J. W. Bell *et al*	5297	30.06	Sep. 2
Catherine	Nelson	R. R. Hedley & E. R. Woakes	4437	44.66	Oct. 6
Creston	Goat River	T. G. Shaughnessey *et al*	5766	32.47	" 8
Cracker Jack	"	" "	5778	50.78	" 8
Cynic	"	" "	5779	51.65	" 8
Cymric	"	" "	5780	51.65	" 8
Crackerjack Fract	"	" "	5781	6.83	" 8
Canada	"	" "	5791	48.83	" 8
Cynic Fraction	"	" "	5782	9.53	" 8
Creston Fraction	"	" "	5839	9.19	" 8
Czar Fraction	"	Charles P. Hill	5833	6.56	" 8
Czar	"	"	5796	49.14	" 8
Copper Fraction	Ainsworth	True Blue Copper Mines	4862	20.25	" 30
Centre Star	Lardeau	J. B. Mackenzie	5659	26.04	Nov. 7
Cliff	Nelson	H. Windebank *et al*	2915	51.65	" 12
Camden	Slocan	A. R. Fingland *et al*	5739	32.03	" 17
C. B	"	"	5740	55.93	" 17
Copper Bell	Nelson	E. Cole, H. A. Hendrickson *et al*	5319	50.08	" 29
Cross Roads	Slocan	S. K. Green & J. W. Power	4116	26	Dec. 15
Dewery	Slocan	W. R. Will & N. F. McNaught	4525	25.44	Jan. 27
Dubrovnik	Trail Creek	F. H. Pokorny	5436	49.80	Feb. 13
Deer Trail	Nelson	F. W. Heslewood & J. Hall	2914	43.70	March 12
Dixie Hummer	Slocan	N. Hickey, W. H. Hawkey *et al*	1912	43.11	April 25
Duplex No. 2	Ainsworth	John Couch Flanders	2173	16.32	" 25
Diamond Jubilee	"	"	5607	14.70	" 25

WEST KOOTENAY.—*Continued.*

Name of Claim.	Division.	Name of Grantee.	Lot No.	Acres.	Date.
Daniel	Slocan	Urban Mining Co., Ltd	5193	44.54	May 6
Donnelly	"	"	5195	35.36	" 6
Drum Lommon	Nelson	Patrick Burns	5481	11.37	July 11
Duke	Trail Creek	Margaret White, Ex. estate Allen G. White, deceased	5715	36.10	Aug. 27
Dakota	Goat River	T. G. Shaugnessy *et al*	5783	30.75	Oct. 8
Deloraine	Slocan	Patrick Burns	3156	47.93	Oct. 30
Dominion	Nelson	J. Astley	1534	5.48	Dec. 15
Elk	Slocan City	Herman Clever	5503	45.32	March 8
Evening	Slocan	D. D. Mann & P. Burns	3169	51.65	" 10
Essie	Trail Creek	Mt. Sicker & B. C. Dev. Co.	5435	1.33	" 15
Emerald Fraction	Ainsworth	George Alexander	5821	46.10	June 11
Eureka	Slocan	Louise Berens *et al*	1753	11.01	" 17
Esquimault Fract.	Trail Creek	Louis Blue, S. Nelson *et al*	5208	35.45	July 21
Emerald	Nelson	P. W. Thompson *et al*	2907	30.76	Sept. 3
Edith	Slocan	J. D. McMaster	4867	25.03	" 9
Edith Fraction	"	"	4870	38.75	" 9
Emma	Arrow Lake	Daphne Mining & Development Co.	5407	43.23	" 11
Eureka	Nelson	J. P. Swedberg	5552	51.34	Oct. 4
Emerald Fraction	Goat River	C. P. Hill	5834	34.07	" 8
Emperor	"	"	5797	51.65	" 8
Emerald	"	"	5798	51.63	" 8
Evening Star	Lardeau	J. B. McKenzie	5658	24.53	Nov. 7
Edinburgh	Slocan	G. H. Dawson	4473	51.65	" 11
Essex Fraction	"	"	4474	19.47	" 12
Elderado	Nelson	R. J. Steel *et al*	2911	47.50	" 12
Ethel Mary	Trail Creek	Catherine D. Campbell	2877	47.83	" 17
Eva	"	J. Olsen *et al*	4202	48.40	" 29
Eldorado	Nelson	Robert C. Pollett	5198	51 56	Dec. 15
F. C. S	SlocanCity	V. & M. Mines Co., Ltd	4262	16.36	Feb. 17
Florence L	Ainsworth	Florence L. McInnes & A. Hill	4462	36.07	Mar. 25
Fletcher	"	H. B. Fletcher *et al*	5608	22.19	June 11
Flood Fraction	Slocan	W. H. Adams *et al*	5750	40.17	" 24
Full Rig	Ainsworth	D. McBeath *et al*	5296	51.65	Sept. 2
Free Silver	Nelson	P. W. Thompson *et al*	2902	27.89	" 3
Fairview	"	"	2903	39.00	" 3
Fedora	Slocan	C. E. Hope	5017	20.63	Oct. 3
Fidelity	Nelson	W. Griffith *et al*	4925	50.50	" 6
Farnham	"	J. Dean, M. Salmon *et al*	5433	46.00	Nov. 26
Great Western	Slocan City	Thos. Blench *et al*	5507	51.65	Jan. 25
Grand Trunk	"	"	5510	29.41	" 25
Grand	Trail Creek	A. B. Mackenzie *et al*	5009	45.19	Feb. 14
Get There Eli	SlocanCity	V. & M. Mines Co., Ltd	4261	12.63	" 17
Glue Pot	Ainsworth	Mary Mackay, E. C. Ward *et al*	1026	51.65	Mar. 12
Galt	Slocan	Urban Mining Co., Ltd	5194	42.92	May 6
Gordon	"	"	5196	26.88	" 6
Gambetta	Trail Creek	C. E. Bennett	3383	45.20	June 19
Gold Standard	Nelson	Aaron H. Kelly	4158	43.94	July 14
Gold Tip	"	" *et al*	4157	27.40	" 17
Gigantic	Trail Creek	Chas. Dundee	5429	51.65	" 21
Great Northern	SlocanCity	Thos. Blench *et al*	5509	51 65	" 25
Good Luck	Trout Lake	Great Western Mines, Ltd	4956	50.72	Aug. 25
Gold Cure	Ainsworth	D. McBeath *et al*	5294	51.65	Sept. 2
Gold Cure Fraction	"	"	5295	11.99	" 2
Gibralter	Nelson	S. S. Fowler	2164	25.89	Oct. 6
Golden West Fract.	Trail Creek	Andrew D. Provand	1300	9.97	" 6
Golden Crown	Goat River	C. P. Hill	5543	41.70	" 8
Golden Cap	"	"	5544	43.45	" 8
Golden Eagle	"	"	5545	48.41	" 8
Gold Queen	Nelson	S. Nelson, J. Astley *et al*	1075	37.50	" 10
Gold Viking	SlocanCity	G. H. Aylard *et al*	4850	45.81	" 29
Gold Bug	Ainsworth	T. G. Proctor *et al*	5029	44.65	Nov. 17
Gertrude Emily	Trail Creek	Catherine D. Campbell	2878	46.26	" 17
Gladstone	"	G. H. Suckling, S. Forteath *et al*	3076	51.30	" 27

WEST KOOTENAY.—*Continued.*

Name of Claim.	Division.	Name of Grantee.	Lot. No.	Acres.	Date.
Gray Mouse	Nelson	E. Cole, C. J. Ditter *et al*	5378	42.31	Nov. 29
Gt. Western No. 2.	Arrow Lake.	F.W. Jordan *et al*	2200	18.94	Dec. 8
Haver Hill	Trail Creek	Thos. Lapslie	4353	34.85	Jan. 14
Hardpan	Revelstoke	J. W. Emerson *et al*	4815	51.65	" 21
Horseshoe	Nelson	Hall Mining & Smelting Co.	2235	30.06	Feb. 12
Hardskracpell	Slocan	Geo. Marr	2135	51.65	" 12
Handy	"	"	2146	36.71	" 12
Hartford	Ainsworth	D. McBeath *et al.*	5298	46.05	" 12
Hewitt	Slocan	Robt. Insinger	4440	48.44	Mar. 12
Hamilton	Nelson	K. D. Green Gold Mining & Dev. Co., Ltd.	5471	49.51	May 8
Halifax Fraction	Slocan	Geo. Kidd	4001	12.18	" 30
Havana	Ainsworth	H. B. Fletcher *et al*	5610	35.84	June 11
Homestake	Nelson	Copper Farm Gold Min. & Dev. Co., Ltd.	3433	33.92	" 20
Hallaes	"	" " "	5467	38.34	" 20
Hartney	Slocan	John D. MacMaster	4864	24.59	Sept. 9
Hunter	"	" "	4868	25.06	" 9
Hub & Hub	"	" "	4869	30.55	" 9
Hercules	Nelson	British Lion Gold Mining & Dev. Co., Ltd., of Ontario	5623	50.03	Nov. 12
I. X. L	Slocan	Miller Creek Mining Co.	5366	14.95	Jan. 28
Iowa	Ainsworth	Cutler T. Parker & C. R. Conner	4911	42.58	Feb. 14
Iron Crown	"	Slocan Sovereign Mines Co., Ltd.	2152	46.83	Mar. 11
Imo	Nelson	Edw. Baillie	2920	51.65	Sept. 5
Imperial Fraction	Revelstoke	J. D. Graham	2763	18.69	Oct. 3
Imperial No. 2	"	W. H. Vickers	2761	51.65	" 3
Inkerman	Nelson	S. S. Fowler	2163	50.38	" 6
Idaho	Goat River	Thos. G. Shaugnessy *et al*	5784	31.16	" 8
Ironside	Slocan	W. C. McLean *et al*	4182	30.25	Dec. 20
Ireland	"	Geo. Kydd	3986	23.84	" 24
Ingersoll	Nelson	K. D. Green Mining & Development Co.	5472	34.34	May 9
Jennie	Slocan	Pat. Burns	3172	51.65	Mar. 10
Jupiter	Nelson	K. D. Green Gold Mining & Dev. Co., Ltd.	5468	39.60	May 8
Jupiter	"	Venus Gold Mining Co., Ltd	4298	37.76	June 3
Jupiter Fraction	"	" "	4307	11.28	" 3
Jay Gould	Slocan	Louise Berens *et al*	1754	11.27	July 17
Kenneth	Ainsworth	Slocan Sovereign Mines Co. Ltd	2153	30.65	Mar. 11
Kaffir	Goat River	W. J. Ledingham	5482	44.73	" 25
Korea	Ainsworth	Edw. Cronyn *et al*	4376	9.60	April 30
Kitchener	Nelson	Andrew Thom	4933	21.36	May 7
Katie D. Green	"	K. D. Green Gold Mining & Dev. Co., Ltd.	5469	50.60	" 9
Kingston	Slocan	J. D. McMaster	4871	49.36	Sept. 9
Keepsake	Goat River	T. G. Shaugnessy *et al*	5774	38.82	Oct. 8
King Fraction	Slocan	Mary Holland	1069	.18	Nov. 11
L. M. Fraction Fr	Nelson	Henry Kearns	3862	20 24	Feb. 18
Littel Perl	"	Emma A. Rand	5181	51.65	" 19
Little Dorrit	Slocan City	Arlington Mines, Ltd	2370	51.65	" 20
Lorna Doone	Nelson	Montana Gold Mining Co.	5441	31.61	Mar. 7
Lorna Doone	Slocan	M. R. W. Rathborne & F. Culver	4441	1.84	" 12
Lucky Find	Ainsworth	J. C. Flanders	5606	45.51	" 15
Last Chance	Nelson	A. D. Grieve	4934	51 63	May 7
London Fraction	"	K. D. Green Gold Mining & Dev. Co., Ltd.	5471	49.51	" 8
Last Chance	"	" " "	5473	34 94	" 8
Lexington Fraction.	Slocan City	F. G. Carlisle	5512	16.40	June 18
Leo	Nelson	Leo (B. C.) Mining Co., Ltd	4365	51.65	" 24
Laura F	Ainsworth	King Solomon Mining Co	3348	43.50	Aug. 25
Legal Fractional	Slocan	C. A. Freeman, L. W. Toms *et al*	4534	11.60	" 28
L. D. Fraction	"	" "	4535	3.20	" 28
La Grande	Goat River	T. G. Shaugnessy *et al*	5776	40 06	Oct. 8
Loder	Slocan City	Arlington Mines, Ltd	5231	45.14	" 9
Lewiston	Nelson	J. A. Turner, M. Scully *et al*	1078	31.09	" 9
Lexington	Lardeau	T. Flack, G. Martin *et al*	3088	39.97	" 10
Lone Star	"	" "	3091	49 61	" 10

WEST KOOTENAY.—*Continued.*

Name of Claim.	Division.	Name of Grantee.	Lot No.	Acres.	Date.
Last Chance	Trail Creek	J. S. Clute, Jr	1875	33.33	Nov. 11
Lerwick	Nelson	British Lion Gold Mining & Dev. Co	5622	50.73	" 12
Lightfoot	Trail Creek	T. M. Edmonson	3387	8.45	" 29
Monument No. 3	Slocan City	J. Duhamel & A. Powys	5011	51.65	Jan. 24
Monument No. 2	"	" Louise Sinkan	5013	51.65	" 24
Monument No. 2 Fr	"	" "	5014	25.45	" 24
Maybe Fraction	Ainsworth	Silver Tip Mining Co	2713	4.93	" 24
Miner Boy	Slocan	C. Shoenberger *et al*	4915	42.23	Feb. 12
Matilda	Nelson	Mt. Sicker & B. C. Dev. Co	5437	43.46	" 19
Michigan	"	Montana Gold Mining Co	5440	47.25	Mar. 7
Minnie Ha Ha	Slocan	Patrick Burns	3171	51.38	" 10
Mount Royal	Ainsworth	Slocan Sovereign Mines Co., Ltd	2154	35.70	" 11
Mole	Slocan	Robert Insinger	3364	26.77	" 12
Montague (D. G.)	Revelstoke	Gold Fields of B. C., Ltd	3596	51.65	May 15
Mercury	Slocan	Robert Cunning, A. David *et al*	3531	41.78	" 27
Morning Star	Ainsworth	A. W. McCune	5822	48.40	June 4
Mountain Scenery	Slocan	Charles McNichol, F. F. Liebscher *et al*	4264	49.75	Aug. 14
May Bee	Trout Lake	Double Eagle Mg. & Dev. Co., Ltd. *et al*	4953	44.97	" 15
M. S.	Nelson	J. J. Fleutot	2916	30.92	" 29
Mountain Boy	Lardeau	J. A. Magee *et al*	2495	31.09	Sept. 12
Morning Sun	Slocan	Byron N. White Co	4856	21.70	" 15
Maple Leaf Fract	Trail Creek	A. D. Provand	2681	2.17	Oct. 6
Maple Leaf	Goat River	T. G. Shaugnessy *et al*	5772	51.64	" 8
Montreal	"	" "	5793	51.65	" 8
Montreal Fraction	"	" "	5835	5.50	" 8
Morning Glory	"	C. P. Hill	5836	50.21	" 8
Minnetonka	Trail Creek	Mary A. Owen	5217	36.50	" 9
Mulligan	Nelson	S. Nelson *et al*	1533	33.25	" 10
Morning Star	Lardeau	Angus McKay & J. B. McKenzie	5660	47.75	Nov. 7
Montezuma	Slocan City	Enterprise (B. C.) Mines, Ltd	5405	31.51	" 10
May Flower	Trail Creek	J. S. Clute, Jr	1876	20.99	" 11
Morning	Ainsworth	G. H. Bayne	4987	49.19	" 25
Midnight	"	"	4988	28.23	" 25
Morning No. 3	Slocan	W. H. Yawkey *et al*	3105	51.65	" 26
Northern Pacific	Slocan City	Thos. Blench *et al*	5511	28.39	Jan. 25
New Springfield	Slocan	Miller Creek Mining Co	5363	43.98	" 28
National Emblem	Nelson	Hall Mining & Smelting Co	2236	37.06	Feb. 12
No. 3	Goat River	Valparaiso Gold Mining Co., Ltd	4911	51.65	May 20
Nabob	Slocan	B. W. Bull & G. J. Atkins	3999	32.75	" 27
New England	"	Geo. Kydd	3987	34.59	" 30
Nettie L	Trout Lake	Great Western Mines, Ltd	4954	51.58	June 16
Nevada	Trail Creek	J. R. Miller	2193	17.20	July 11
Number Three Fr	Slocan	G. W. Hughes *et al*	3532	17.20	Aug. 28
Niagara	Nelson	J. A. Turner *et al*	1077	24.77	Oct. 9
New Phœnix Fract.	Slocan City	G. H. Aylard *et al*	4851	31.74	" 29
Nonpareil	Slocan	W. C. McLean *et al*	4179	47.87	Nov. 26
Nonpareil Fraction	"	" "	4554	14.14	" 26
Napoleon	Nelson	H. A. L. Ecuyer	4937	51.65	" 28
Olive	Trail Creek	W. M. Griffiths *et al*	4926	43.50	Jan. 28
Orion	Nelson	Venus Gold Mining Co., Ltd	4294	44.98	June 3
Orion Fraction	"	" "	4306	1.06	" 3
Ophir No. 3	Slocan	A. B. Railton *et al*	5368	45.59	Sept. 15
O. Ray	Goat River	T. G. Shaugnessy *et al*	5768	38.74	Oct. 8
Osborne	"	" "	5795	51.65	" 8
Old Glory	"	" "	5787	48.17	" 8
Portepin	Nelson	Frank Desaulnier *et al*	5036	42.32	Mar. 12
Paisley	Ainsworth	H. B. Fletcher *et al*	5612	43.03	June 11
Parrot	Trail Creek	C. E. Bennett	3382	51.65	" 19
Paymaster	Slocan	Fred. Swannell	5732	10.95	July 9
Peacock	Ainsworth	True Blue Copper Mines, Ltd	4860	36.45	" 10
Porcupine	Nelson	P. W. Thompson *et al*	2908	42.24	Sept. 3
Pacific	Goat River	T. G. Shaugnessy	5790	51.65	Oct. 8
Portland	Slocan City	Arlington Mines, Ltd	4775	32.44	" 9

WEST KOOTENAY.—*Continued.*

Name of Claim.	Division.	Name of Grantee.	Lot No.	Acres.	Date.
Queen	Nelson	J. A. Turner, M. Scully *et al*	1076	34.45	Oct. 9
Red Fox	Slocan	R. G. Henderson, C. M. Gething *et al*	2413	6	Feb. 15
Reno	Slocan City	V. & M. Mines Co., Ltd	4259	30.84	" 17
Red Fox Fraction	Slocan	R. G. Henderson, C. M. Gething *et al*	2414	1 37	" 18
Randolph	Nelson	Montana Gold Mining Co	5442	31.58	Mar. 7
Rincon Fraction	Slocan	Robt. Insinger	3362	36.70	" 12
Rincon	"	"	3363	51.47	" 12
Republic No. 2	Slocan City	Slocan Republic Mining & Dev. Co., Ltd	5498	50.91	April 23
Ruby Fraction	Ainsworth	G. Alexander	5820	27 70	June 11
Rover	Nelson	Harold Selous	5292	51.65	Sept. 3
Rambler	"	"	5293	51 65	" 3
Royal	"	P. N. Thompson, A. Johnson *et al*	5322	51.65	" 3
Ruby	"	" "	2904	28.07	" 3
Red Cap	Trail Creek	Mary A. Owen	5216	31.30	Oct. 4
Red Seal	Nelson	Emma A. Rand	2918	37.24	" 6
Rhodesia	Goat River	T. G. Shaugnessy *et al*	5775	31.40	" 8
Rattler	"	C. P. Hill	5837	51.63	" 8
Rambler	"	"	5838	29.75	" 8
Red Fox	Lardeau	Angus McKay	5656	46 44	Nov. 7
Ridge	"	"	5657	31.51	" 7
Ramsey	Nelson	Duncan McArthur	4211	9.04	" 18
Sunbeam	Trail Creek	Thomas Lapslie	5008	10.54	Jan. 14
Sampson	Slocan	Miller Creek Mining Co	5365	24.69	" 28
Sligo Fraction	"	W. R. Will & N. F. McNaught	4526	3.03	" 27
Shamrock	Nelson	Hall Mining & Smelting Co	2234	43.25	Feb. 12
Susquehanna	Ainsworth	David McBeath *et al*	5299	51.65	" 12
Snowstorm Fract	"	C. T. Porter & C. R. Conner	4993	39 67	" 14
Sailor Boy	Trail Creek	Umatilla Gold Mining Co., Ltd	4244	35.22	" 18
Sligo Fraction	Slocan	W. R. Will & N. F. McNaught	4526	3.03	Jan. 27
Silver Reef	Nelson	J. J. Malone & T. G. Roy	5033	37.44	Feb. 19
Salem	Ainsworth	G. P. Cragin *et al*	5601	23.10	Mar. 14
San Antonia	"	" "	5602	44.50	" 14
Skookum	Slocan City	New Gold Fields of B. C., Ltd	4266	49.04	April 25
Sunrise	Slocan	Ruth Mines, Ltd	5749	41.92	" 29
Starter	Goat River	Valparaiso Gold Mining Co., Ltd	4912	51.65	May 20
Silver Bill	Slocan	Robt. Cunning, A. David *et al*	3530	51.65	" 27
Stars and Stripes	Ainsworth	Trust Mining Co	4899	47.77	" 30
Sixteen-to-One	"	" "	4901	40 50	" 30
Scotland	Slocan	Geo. Kydd	3988	43.36	" 30
Summit Fraction	"	Wm. Kent	5599	12 90	" 30
Surprise Extension	"	"	5600	38.04	" 30
Saturn Fraction	Nelson	Venus Gold Mining Co., Ltd	4297	13.38	June 3
Scorpion	Slocan City	Thos. Andrews	2894	51.65	" 17
Silver Leaf	Slocan	Ernest C. Britton & J. Fletcher	4263	51.65	" 17
St. Helena	"	J. S. C. Fraser	3799	41.20	" 19
Silver Bow	Lardeau	Double Eagle Mining & Development Co	5678	51 65	July 9
Sunset	Nelson	E. Peterson & J. Olsen	3971	32.45	" 11
Sylvanite	Slocan	Byron N. White Co	4866	20.13	Sept. 9
Shogo	"	" "	4857	8.00	" 15
Surprise	Revelstoke	J. D. Graham	2762	51.65	Oct. 3
Sullivan	Nelson	W. Griffith & T. A. Cameron	4924	50.52	" 6
Snow Cap	Goat River	T. G. Shaugnessy *et al*	5777	42.94	" 8
Scotland	"	" "	5794	51.65	" 8
Scotland Fraction	"	" "	5840	15.14	" 8
Summit Fraction	Slocan City	R. I. Kirkwood	5731	13.50	" 9
Stemwinder	Nelson	Alex. Macdonald	5301	40.50	" 14
Sea Lion	Lardeau	Angus McKay *et al*	5655	39.60	Nov. 7
Shandon Bell	Trail Creek	J. S. Clute, Jr	1877	21.26	" 11
Snowflake	Nelson	British Lion Gold Mining & Development Co.	5621	47.47	" 12
Seelig Fraction	Slocan	Bosun Mines Ltd	4855	1.24	" 14
Santiago	Nelson	F. D. LeMieux	5381	38.11	" 18
Stanley No. 2	Slocan	H. Clever, H. Stege *et al*	4872	31.59	" 26
Seattle	"	W. C. McLean *et al*	4178	39.55	" 26
Seattle Fraction	"	" "	4555	18.58	" 26
Sampson	Nelson	Chas. J. Ditter	5376	46.69	" 29

WEST KOOTENAY.—*Concluded.*

Name of Claim.	Division.	Name of Grantee.	Lot No.	Acres.	Date.
Trout	Nelson	Montana Gold Mining	5439	51.65	March 7
Tranquility	Slocan	Robert Insinger	3366	48.12	" 12
Tamarack	"	J. M. Martin	5444	50.45	" 12
T. G.	Trail Creek	Mt. Sicker & B. C. Dev. Co.	5434	23.97	" 15
Tiger	Nelson	H. E. Hammond	4932	28.00	May 7
Tangier (D. G.)	Revelstoke	Gold Fields of B. C., Ltd.	3600	51.65	" 15
Troy	Slocan	J. S. C. Fraser	3800	42.80	June 19
True Blue	Ainsworth	True Blue Copper Mines, Ltd.	4859	48.62	July 10
Triumph	Slocan	W. C. Yawkey and N. Hickey	4552	50.22	" 22
Triumph Fraction	"	" "	4849	.47	" 22
Tom Bowling	"	" "	4549	27.43	" 22
Tramp Planet Frac.	"	A. S. Farwell	2359	6.10	Aug. 25
Two Friends	Slocan City	A. M. Johnson *et al*	1020	50.70	Oct. 3
Toronto	Goat River	T. G. Shaugnessy *et al*	5792	50.20	" 8
Transvaal	Nelson	P. Chapman, D. McArthur *et al*	5300	44.12	" 20
Touchmenot	"	Louis Will	5202	28.26	Nov. 12
Theresa M	Ainsworth	J. D. Warren	5826	42.75	Dec. 9
Turris	Slocan	W. R. Will & N. F. McNaught	4523	51.65	Jan. 27
Thistle	Nelson	Hall Mining & Smelting Co	2233	49.00	Feb. 12
Thorn Fraction	"	" "	2237	35.23	" 12
Texas	Ainsworth	C. T. Porter & C. R. Conner	4992	47.39	" 14
Umatilla	Trail Creek	Umatilla Gold Mining Co., Ltd	4242	26.28	Feb. 18
U. P.	"	Mary A. Owen	5215	42.60	Oct. 4
Union Jack	Goat River	T. G. Shaugnessy *et al*	5765	32.61	" 8
Union Jack Fract.	"	" "	5769	15.67	" 8
Victor	Trail Creek	W. M. Griffiths & T. A. Cameron	4927	41.50	Jan. 28
V. & M	Slocan City	V. & M. Mines Co., Ltd	4260	20.93	Feb. 14
Vermont	Nelson	H. L. A. Keller, A. S. Keller *et al*	3801	37.50	" 20
Violet	Slocan	D. D. Mann	3168	21.33	Mar. 10
Violet Fraction	"	Patrick Burns	3170	14.08	" 10
Victoria No. 6	"	G. D. McMartin *et al*	3154	35.16	" 15
Victoria	Slocan City	New Gold Fields of B. C., Ltd	4265	40 19	April 25
Valparaiso	Goat River	Valparaiso Gold Mining Co., Ltd	4907	29 73	May 20
Venus	Nelson	Venus Gold Mining Co., Ltd	4293	44.57	June 3
Victor	"	P. N. Thompson, A. M. Johnson *et al*	2906	50.04	Sept. 3
Viking Fraction	Slocan City	R. G. Henderson *et al*	4852	9.99	Oct. 29
Virginia Dare	Ainsworth	T. G. Proctor, H. Roy *et al*	5028	40.50	Nov. 17
Vernon	Slocan	W. C. McLean, J. G. McLean *et al*	4181	29.65	" 26
Wonderful Fraction	"	Miller Creek Mining Co	5364	17.38	Jan. 28
Wallace	"	W. R. Will & N. F. McNaught	4524	29.72	" 27
Warfare	Nelson	Catherine Seed & W. Seed	5465	44.84	May 6
Waverly	Revelstoke	Waverly Mine, Ltd	3597	44.88	" 15
Whistler	Ainsworth	H. B. Fletcher, A. M. Fletcher *et al*	5614	48.51	June 11
White Pine	Nelson	Dundee Gold Mining Co., Ltd	4004	37.00	July 13
Wellington	Slocan	Louise Berens	1755	20.54	" 17
White Horse	"	Chas. E. Hope	5015	46.16	Oct. 3
Walrus	Lardeau	A. McKay & J. B. McKenzie	5653	48.13	Nov. 7
Wales	Trout Lake	R. Marpole	3481	51.65	" 28
Widow	Nelson	E. Cole, C. J. Ditter *et al*	5377	46.26	" 29
X Ray	Goat River	T. G. Shaugnessy *et al*	5771	47.83	Oct. 8
X Ray Fraction	"	" "	5773	15.46	" 8
Yellow Jacket	Nelson	Louis Will	5203	44.10	Dec. 24

EAST KOOTENAY.

Ames	Fort Steele	Harry L. Amne.	4047	27.30	Jan. 30
Alice	Windermere	J. S. Johnston *et al*	5350	34.57	Nov. 10
Big Chief	Fort Steele	Knut J. Higbye	4046	38.74	Jan. 30
Big Bend Boy	"	C. M. Parker	5453	49.39	Nov. 10

EAST KOOTENAY.—*Concluded.*

Name of Claim.	Division.	Name of Grantee.	Lot. No.	Acres.	Date.
Colorado	Windermere.	B. Morigean, G. A. Stark *et al*	4099	33.93	June 19
Contention Fraction	"	Paulding Farnham	5348	24.04	Nov. 10
Daffodil Fraction	Fort Steele	North Star Mining Co., Ltd	3921	4.75	Mar. 21
Delphine	Windermere.	H. C. Hammond & C. M. Kingston	4334	39.80	Dec. 8
Emerald Fraction	Fort Steele	North Star Mining Co., Ltd	3922	9.07	Mar. 21
Eureka	Windermere.	H. C. Hammond & C. M. Kingston	4335	27.26	Dec. 8
Empire	Golden	Ewen Maekenzie	506	51.65	" 29
Golden Coin	Fort Steele	W. Van Arsdalen	4048	37.60	Jan. 30
Honey Comb	"	C. M. Parker	5454	50.95	Nov. 10
Iron Cap	Windermere.	Paulding Farnham	5347	51.65	Nov. 10
Iron Crown Frac		"	5349	14.54	" 10
King Solomon	Fort Steele	C. M. Parker	5451	51.65	Nov. 10
Little Chief Frac	Golden	J. L. Spink, J. J. Kenny, *et al*	5513	8.50	Jan. 21
Midas	Fort Steele	P. C. Andrews, H. H. Browne *et al*	5456	44.04	April 29
Mary G	Windermere.	B. Morigean, H. C. Hammond *et al*	4098	50.68	June 18
Morning Star	Fort Steele	G. Mathews & A Swanson	5035	49.02	July 23
Ontario	Golden	Ewen Maekenzie	507	51.65	Dec. 29
Queen of Sheba	Fort Steele	C. M. Parker	5452	41.49	Nov. 10
Quebec	Golden	Ewen Maekenzie	511	46.10	Dec. 29
Red Line No. 1	Windermere.	Paulding Farnham	5345	51.65	Nov. 10
" " 2		"	5346	47.62	" 10
Shrewsbury	Fort Steele	H. B. Thomson *et al*	5584	43.21	April 19
Sitting Bull	Windermere.	B. Morigean, H. C. Hammond *et al*	4097	51.65	June 19
616	"	H. C. Hammond & C. M. Kingston	4333	39.95	Dec. 8
Tramway	Fort Steele	James Ryan	4688	49.19	Feb. 13

YALE

Aldeen	Grand Forks	W. B. Townsend	1749	39.70	Feb. 20
Alpine	Osoyoos	Louis O. Hedlund & J. Greenhill	2672	21 00	June 17
Astor	Kettle River	Rock Creek Gold Mines, Ltd	1544	46.90	July 24
Apex	"	G. W. Rumberger *et al*	1696	27.87	" 25
Arizona	"	Chris. McDonnell & T. W. Stack	1194	51.65	Oct. 27
Aberdeen	"	J. D. Norrish, A. E. Cross *et al*	2295	35.55	" 30
Anaconda	"	Ainsley Megraw *et al*	1546	49 30	Nov. 25
Aorangi	Osoyoos	Myron K. Rodgers	1796	28.82	Dec. 20
Big Four	Kettle River	J. Dunn, J. S. Steel *et al*	1581	49.77	Feb. 17
Black Pine	Osoyoos	E. Bullock-Webster	1912	51.65	March 5
Bush Rat	"	" "	1913	51 65	" 5
Black Jack	"	" "	1914	51.65	" 5
Blue Bell	"	" "	2472	30.00	" 5
Bonnie Etta	Kamloops	J. Armstrong & Belinda Wallace	881	49 30	" 14
Big Chief	Grand Forks	Wm. Austin *et al*	962	41.71	July 15
Birthday	"	Richd. Plewman & A. Gee	1134	51.65	Oct. 4
Bell	Kettle River	J. T. Bell *et al*	2343	51.65	Nov. 7
British Empire	Vernon	J. Highman, H. G. Muller *et al*	2539	51.65	" 12
Burnt Basin Frac	Grand Forks	Tammany Gold Mines, Ltd	1141	8.26	Dec. 24
Butte	"	Clark Seattle Gold Mining Co.	1610	25.60	" 24
Big Six	"	T. P. McIntyre & O. E. Robinson	2906	39.31	" 24

YALE.—*Continued.*

Name of Claim.	Division.	Name of Grantee.	Lot No.	Acres.	Date.
Caroline	Grand Forks	E. Hamlin, F. Lange *et al*	2483	51.65	Mar. 19
Colorado	"	W. G. McMynn	2236	51.65	" 21
Contact	"	Contact Gold Mines, Ltd	1421	36.00	April 17
Crown Point	Kettle River	Jas. Douglas *et al*	2448	34.71	May 12
Copper King No. 2.	"	Pat. J. Dermody & T. B. Garrison	2297	47.76	June 24
Cameronian	"	Alex. Cameron	2525	50.87	" 24
California	"	Rock Creek Gold Mines, Ltd	1453	45.10	July 24
Copper Reef	Similkameen	Chas. E. Thomas *et al*	1830	45.16	Sept. 11
Copper King	"	" "	1831	51.62	" 11
Copper Bench	"	" "	1833	48.83	" 11
City of London	Grand Forks	Mary A. Cornwall	1258	15.40	Oct. 9
Cliff	"	W. T. Oliver	2115	50.62	Nov. 14
Copper Cleft	Osoyoos	Myron K. Rodgers	1877	42.35	Dec. 20
Cuba	Grand Forks	H. G. S. Heisterman	1650	40.00	" 24
Duplicate	"	Wm. Shaw, J. McNicol *et al*	863	37.00	Feb. 14
Don Pedro	Kettle River	Nicolas Kulmen	2458	49.00	" 14
Delta Fraction	Grand Forks	Summit Gold & Copper Mining Co.	1744	38.20	June 17
Dont Know	Kettle River	G. R. Naden & S. M. Johnson	2374	51.49	Oct. 30
Dominion	Grand Forks	J. P. Shannon	1723	44.47	Nov. 17
Don Jules Fraction	Kettle River	B. C. Copper Co., Ltd	1283	1.01	Dec. 9
Danube Fraction	Osoyoos	Myron K. Rodgers	1797	2.07	" 20
Dominion	Kettle River	Clive Pringle	2587	51.65	" 24
Evening Star	Grand Forks	J. K. Fraser	1681	43.68	Mar. 19
Electric	Kettle River	Vancouver & Boundary Ck Dev. & Mg. Co.	1575	30.02	June 15
Emerald	"	S. M. Johnson, J. C. Haas *et al*	1263	32.23	Oct. 3
Electric	Grand Forks	Richard Plewman & Addie Gee	1049	50.52	" 4
Edison	"	" "	1132	51.59	" 4
Emerald	"	W. T. Oliver & T. Walsh	1428	44.58	Nov. 14
Emma Fraction	Kettle River	L. S. M. Barrett	2122	20.20	" 25
Eva Bell	Grand Forks	J. Rogers & H. L. Jones	2031	51.65	Dec. 24
Far West	Osoyoos	E. Bullock-Webster	2469	51.65	Mar. 5
Frisco	"	D. A. Stewart, J. Nelson *et al*	2430	45.66	" 6
Free Coinage	Kettle River	T. W. Stack, T. A. Howard *et al*	1552	34.40	Oct. 24
Four Ace	"	R. Jaffray, W. T. Smith *et al*	2400	45.69	April 16
Falcon	Vernon	F. H. Latimer	903	51.65	July 22
Florence Fraction	Kettle River	Clive Pringle	1470	4.32	April 25
Gold Bed	"	G. E. Foster & J. C. Haas	1388	41.60	" 16
Glengarry	Grand Forks	Contact Gold Mines, Ltd	2594	16.00	" 17
Grand Central	Kettle River	J. Dunn, J. L. Steele *et al*	1842A	44.95	" 24
Golden Eagle	"	R. Wood & C. L. Thomet	1164	51.65	May 15
Gold Hill	Osoyoos	E. D. Boeing & S. Mangott	1916	51.65	June 16
Gold Commissioner	Kettle River	P. J. Dermody & T. B. Garrison	2298	47.90	" 25
Gladstone	Grand Forks	Ellen McEwen	2283	31.14	July 25
Grand View	Osoyoos	W. A. Marsh	2479	4.00	Aug. 27
Golden Home	Grand Forks	Mary A. Owens	2026	35.31	Oct. 3
Glasgow Fraction	Kettle River	No. 7 Mining Co., Ltd	1638	38.20	" 28
Glouster	Grand Forks	Thewby L. Merson *et al*	2809	44.80	Dec. 29
G. H.	"	" "	2810	51.65	" 29
Great Hesper	Kettle River	J. C. Haas & J. McNicol	1887	51.65	June 18
Hub Fraction	Osoyoos	E. Bullock-Webster	2470	40.60	Mar. 5
Humming Bird Frac	Grand Forks	Neil Hardy, H. St. Quentin *et al*	1249	25.12	April 15
Highland Chief	"	J. H. Fox	2016	42.70	" 24
Hamilton	Kettle River	N. Garland	2079	42.76	Aug. 15
Helen	"	No. 7 Mining Co	1639	42.90	Oct. 28
Idola	"	Nicholas Kuhmn	2460	15.68	Feb. 14
Idaho	"	J. Luey & L. F. Largey (Adm. est. P. A. Largey)	1856	51.65	Aug. 26
Ironsides Fraction	"	A. W. Douglas	2406	42.17	Oct. 24
Independence	"	Clive Pringle	2311	44.05	Nov. 28
Jennie May	Grand Forks	E. R. Shannon *et al*	1248	43.18	July 7
Joe Dandy	Kettle River	L. S. M. Barrett	2120	51.21	Nov. 25

YALE.—*Continued.*

Name of Claim.	Division.	Name of Grantee.	Lot No.	Acres.	Date.
Jim Blaine Fraction	Grand Forks	Tammany Gold Mines, Ltd.	1140	7.00	Dec. 24
Kittie	"	W. B. Townsend	1748	34.63	Feb. 20
Kufman	"	F. B. Goetter & A. McDougall	2285	6.96	June 24
King	Osoyoos	P. Scott, R. R. Hedley *et al*	2477	8.00	July 23
Keystone	Kettle River	G. W. Rumberger *et al*	1698	34.70	" 25
Kingston	Osoyoos	W. A. Marsh	2474	31.00	Aug. 27
Kingston Fraction.	"	Peter Scott	2481	6.50	" 27
Key West	Grand Forks	Wm. Garrett, H. Belt	1768	48.18	" 28
Lulu	Kettle River	J. Dunn, J. L. Steele *et al*	1584	37.22	Feb. 14
Little Bessie	Osoyoos	E. Bullock-Webster	1915	51.65	Mar. 5
Loyal Canadian	Grand Forks	E. Clark & C. Hay	1608	43.61	May 12
Lake View	Kettle River	Vanconver & Boundary Creek D. & M. Co.	1576	47.28	Aug. 15
Laura	"	Mary McArthur, R. Naden, *et al*	1417	30.15	" 26
Legal Tender	"	T. W. Stack, T. A. Howard *et al*	1551	32.30	Oct. 14
Lake View Ext'sion	Osoyoos	Ida Thompson & F. W. McLaine	2468	33.00	" 28
Lucy	Grand Forks	W. T. Oliver & T. Walsh	1427	51.07	Nov. 14
Lost Horse	Kettle River	L. S. M. Barrett	2119	37.70	" 25
Lead King	"	H. R. Elliot, H. Hamlin *et al*	2071	34.09	" 28
Last Chance Frac.	Grand Forks	Tammany Gold Mines, Ltd.	2597	18.84	Dec. 24
Marie Stuart	"	J. P. Graves	868	5.95	Mar. 10
Moonlight	"	Milton D. White	1623	51.65	April 15
Mountain View	"	Contact Gold Mines, Limited	2592	47.30	" 17
Mountain View Frac	"	" "	2593	38.50	" 17
Manitou	"	R. Cooper	1753	30.20	" 24
Mollie	"	J. F. Cunningham *et al*	2111	45.86	June 16
Main	"	Summit Gold & Copper Mining Co	1745	15.69	" 17
Margrie	Kettle River	M McArthur & G. R. Naden	2088	23.02	" 18
Metropolitan	Osoyoos	W. A. Marsh	2480	36.20	Aug. 27
Midnight	Grand Forks	J. Mulligan	809	45.09	" 28
Moncton	"	R. Plewman & Addie Gee	1048	51.65	Oct. 4
McKinley	"	H. G. S. Heisterman	2546	28.64	Mar. 11
McGregor	Kettle River	No. 7 Mining Co	1641	50.90	Oct. 28
Mound	Osoyoos	M. K. Rodgers	1876	51.65	Dec. 20
Napa	Kettle River	J. Dunn, J. L. Steele *et al*	1583	47.62	June 18
No. 3 Fraction	Grand Forks	E. R. Shannon *et al*	2286	23.97	July 7
No. 2	Kettle River	J. Douglas, J. Atwood *et al*	2445	33.61	Oct. 30
No. 3	"	" " "	2447	38.37	" 30
Niekel Plate Frac.	Osoyoos	M. K. Rodgers	735	.3	Dec. 20
No. 2	Kettle River	Clive Pringle	2588	37.34	" 24
Old Kentucky	"	L. S. M. Barrett	2121	51.65	Nov. 25
Opher	Grand Forks	T. Newby, L. Merson *et al*	2811	51.65	Dec. 29
Princeton	Osoyoos	Peter Scott & E. D. Boeing	2476	21.90	Feb. 17
Paragon	Kettle River	J. Dunn, J. L. Steel *et al*	1582	26.58	" 17
Plat	"	Philip Aspinwall	1720	37.92	Mar. 21
Picton	"	D. A. Cameron	2524	48.55	June 24
Princess	Grand Forks	Ed. R. Shannon *et al*	1245	36.75	July 7
Prineess May	Similkameen	Charles Powell	1829	41.76	" 25
Pietou	Grand Forks	R. Plewman & A. Gee	1047	51.65	Oct. 4
Pole Star	Kamloops	J. A. Mara, Andrew Noble *et al*	1012	51.65	" 22
Prineess Maud	Similkameen	Robert Stinson	1837	32.38	Dec. 24
Queen	Kettle River	Rock Creek Gold Mines, Ltd	1454	50.40	July 24
Quien Sabe	"	G. A. Guess, S. M. Johnson *et al*	1267	46.39	Aug. 26
Queen Bess	"	F. B. Goetter & W. G. McMynn	1779	42.39	Oct. 23
Rumpalo	"	L. Scain, A. Scain *et al*	2408	51.65	April 17
Rollo	Osoyoos	P. Scott, R. Hedley *et al*	2475	37.57	July 23
Robt. Emmett	Kettle River	C. J. McArthur, G. R. Naden *et al*	1857	44.65	Aug. 26
Royal Sovereign	Vernon	J. Highman, H. G. Muller *et al*	2540	48.15	Nov. 12
Riley	Kettle River	L. S. M. Barrett	2123	38.60	" 25
Rambler Fraction	"	F. J. Finucane	2797	51.19	Dec. 24

YALE.—*Concluded.*

Name of Claim.	Division.	Name of Grantee.	Lot No.	Acres.	Date.
Silver Lump	Kettle River	L. Scain, A. Scain *et al*	2409	50.92	April 17
Superior	Grand Forks	E. H. Willett & D. G. Evans	1622	47.26	" 24
Silver Duck Frac.	Kettle River	F. Kefler & M. Garland	1648	6.45	July 4
Smuggler	"	G. W. Rumberger, T. B. Garrison *et al*	1697	50.59	" 25
Silver Star	"	T. W. Stack, C. McDonnell *et al*	1550	45.00	Oct. 24
St. Eugene Fraction	"	L. J. Ostroski & J. R. Jacobs	2321	7.10	Nov. 28
Silver Plate	Osoyoos	M. K. Rodgers	743	29.09	Dec. 20
Sunshine Fraction	"	"	1794	1.50	" 20
Sutter	Similkameen	Star Expl. & Mining Co	93	51.65	Aug. 21
Tamarack Fraction	Kettle River	Erl Syndicate, Ltd	1400	2.40	Feb. 14
Tunnel	Grand Forks	W. B. Townsend	1750	36.40	" 20
Two Bros	Osoyoos	F. Fera ($\frac{2}{3}$ interest)	2463	46.28	May 12
Tredwell	Grand Forks	J. F. Cunningham *et al*	2112	9.34	June 16
Toledo Fraction	"	Summit Gold & Copper Mining Co	1743	43.15	" 17
Triune	Osoyoos	E. Bullock-Webster	2471	37.00	Aug. 25
Temerane Fraction	Kettle River	L. S. M. Barrett	2118	20.30	Nov. 25
Texas Fraction	"	" "	2124	10.50	" 25
Victoria	Osoyoos	F. Fera ($\frac{2}{3}$ interest)	2464	49.00	May 12
Vanguard	Grand Forks	Summit Gold & Copper Mining Co	1746	37.99	June 17
Virginius	"	W. T. Oliver & T. Walsh	1431	6.20	Nov. 14
Virginia City	"	Clark Seattle Gold Mining Co	1606	50.20	Dec. 24
Wild Rose Fraction	Kettle River	J. C. Haas & G. E. Foster	1387	16.00	Feb. 14
Wonderful	Grand Forks	A. B. Williams & S. A. Singlehurst	1736	41.06	June 16
War Horse	Osoyoos	W. A. Marsh	2478	33.80	Aug. 27
Woodland	"	M. K. Rodgers	1798	34.50	Dec. 20
Warrimoo	"	R. H. Parkinson	1795	36.90	" 20
Yellowstone	Kettle River	Nicholas Kuhmn	2459	40.00	Feb. 14
Yukon Fraction	"	G. W. Rumberger	1193	39.44	June 18

LILLOOET.

Monarch	Lillooet	Toronto-Lillooet Gold Reefs Co., Limited	577	49.80	May 19
St. Joseph	"	A. St. G. Hamersley	537	51.65	Nov. 11
St. John	"	" "	538	48.65	" 11
Why Not	"	A. McDonald, D. Morrison *et al*	649	51.36	July 7

COAST—ALBERNI AND WEST COAST V. I.

Conqueror	Alberni	R. T. Godman	153G	40.85	May 6
Hampton	"	W. O. Carter & L. Goodacre	539	45.00	Nov. 28
John Bull	"	Monitor Copper Mining Co., Ltd	529	19.00	April 28
Jumbo	"	J. W. Wright	97G	40.50	Dec. 1
Kitchener	"	E. Phillips	49	51.65	March 8
Leschi	West Coast	Dewdney Can. Syndicate *et al*	583	51.45	July 16
Lakeview	Alberni	R. T. Godman	151G	28.04	May 6
Modoc	"	B. C. Agency, Ltd	48	47.51	March 8
Majestic	"	R. T. Godman	154A	35.22	May 6
Monitor No. 1	"	Monitor Copper Mining Co	532	46.30	Nov. 10
" No. 1 Frac	"	" " "	533	14.76	" 10
" No. 2	"	" " "	534	40.14	" 10

COAST—ALBERNI AND WEST COAST.—*Concluded.*

Name of Claim.	Division.	Name of Grantee.	Lot No.	Acres.	Date.
Nahwitka	Alberni	Monitor Copper Mining Co	530	34.00	April 28
" Fraction	"	" " "	531	.48	" 28
Prince	West Coast	T. R. Marshall	572	20.30	Jan. 21
" No. 2	"	"	573	49.10	" 21
" No. 3	"	"	574	22.00	" 21
" No. 4	"	"	575	51.65	" 21
" No. 6	"	"	576	33.45	April 9
" No. 7	"	"	577	51.07	" 9
" No. 5	"	"	578	51.49	Sept. 11
" No. 8	"	"	579	51.51	" 11
Pride of the West	Alberni	W. O. Carter & L. Goodacre	538	42.30	Nov. 28
Pansy	"	J. M. Wright	926	49.00	Dec. 1
Primrose	"	"	936	47.00	" 1
Rose	"	J. M. Wright	856	51.00	" 1
Scotlet	West Coast	Dewdney Can. Syndicate *et al*	582	38.21	July 16
Tinnicanum	"	Dewdney Can. Syndicate *et al*	580	47.70	" 16
Thistle	Alberni	J. M. Wright	916	51.65	Dec. 1
Union	"	Mt. Sicker & B. C. Dev. Co., Ltd	146	46.47	March 17
Uncle Sam	"	Monitor Copper Mining Co., Ltd	528	31.43	April 28
Victor	West Coast	Dewdney Can. Syndicate *et al*	571	51.65	July 16
Victor No. 1 Frac.	"	" " "	584	11.66	" 16
War Lion	Alberni	R. T. Godman	1526	48.88	May 6

COAST—NANAIMO.

Comet	Nanaimo	H. Stanton, F. McB. Young *et al*	203	51.65	April 30
Cameron	"	A. G. Milner & B. J. Toben	182	51.65	" 19
Dexter	"	R. Robinson	208	51.65	" 10
Fairview	"	Texada Gold Mines, Ltd	210	41.38	" 26
Full Moon	"	B. C. Trust Co., Ltd	2045	45.80	Nov. 28
Full Moon Extension	"	" "	2047	51.65	" 28
Golden Era	"	A. B. Mackenzie, N. A. Mackenzie *et al*	104	44.00	Feb. 14
Index	"	R. Robinson	209	49.44	April 16
Mountain Chief	"	Emma J. Pleace & W. H. Mooton	55	51.65	" 10
Marjorie	"	Texada Gold Mines Co	217	39.75	" 26
Monte Christo	"	H. W. Treat	344, R 1	36.40	June 20
Midas Fraction	"	W. A. Bauer	215, T 1	19.26	Sept. 11
New Moon Fraction	"	B. C. Trust Co	2046	3.30	Nov. 28
Rino	"	E. S. Cook & W. Leck	246	48.14	April 26
Saga	"	Texada Gold Mines Co	216	47.43	" 26
Summit	"	E. S. Cook, W. Leck	245	43.75	" 26
Tenas Fraction	"	Texada Gold Mines Co	211	18.20	March 26
Wild	"	" "	212	32.91	June 11

COAST—NEW WESTMINSTER.

Name of Claim.	Division.	Name of Grantee.	Lot No.	Acres.	Date.
Hunter's Friend...	New West'r.	Goldsmiths Copper Co, Ltd	1917	51.65	Oct. 6

COAST—VICTORIA.

Banner	Victoria	S. F. Erb.....	760	51.60	Oct. 1
Cold Steel	"	H. E. Newton & R. T. Godman..	128	51.65	June 12
Jen	"	R. T. Godman & H. E. Newton..	123	42.39	Oct. 25
Max.....	"	R. T. Godman & H. E. Newton.....	121	51.65	June 12
Puffing Billy	"	R. T. Godman & H. E. Newton.....	126	20.83	Oct. 25
Pig Iron.....	"	" "	127	44.96	" 25
Rambler.....	" ..	R. T. Godman.	122	43.38	" 25
Rose	"	R. T. Godman & H. E. Newton.....	124	21.07	" 25
Star.....	"	M. E. Palmer, W. H. Phipps *et al*.....	196	51.65	Dec. 1
Sullins.....	"	L. W. Sullins & C. V. Brown.....	1096	50.90	Oct. 1
Thorn	"	R. T. Godman..... ..	125	32.89	" 25
Tintoview.....	"	R. A. Allen.....	786	51.65	Dec. 1

SKEENA.

Bluff	Skeena	E. A. Cleveland.....	34, R. 4	33.75	Aug. 22
Bench	"	E. A. Cleveland & G. A. Kelly	35 " 4	26.67	" 22
Bluestone.....	"	B. C. Pyrites Co., Ltd.....	111 " 4	51.65	" 27
Bell Helen	"	" "	112 " 4	51.60	" 27
D. L. S.....	"	E. A. Cleveland.....	31 " 4	51.65	" 22
Four Ace	"	P. Hickey, H. Flewin *et al*....	166	51.65	Nov. 26
Gulch	"	E. A. Cleveland & G. A. Kelly.....	33 " 4	51.65	Aug. 22
Golconda.....	"	P. Hickey, H. Flewin *et al*	167	49.35	Nov. 26
La Toxa	"	Niagara Mining & Development Co	153 " 5	51.40	Aug. 21
Lake Fraction.....	"	E. A. Cleveland & G. A. Kelly.....	32 " 4	26.72	" 22
LaQuinree	"	E. A. Cleveland.....	39 " 4	48.97	" 22
Laurier.....	"	P. Hickey, H. Flewin *et al*.....	169 " 5	51.65	Nov. 26
Mountain Fraction.	"	E. A. Cleveland & G. A. Kelly.....	37 " 4	40.87	Aug. 22
McKinley	"	P. Hickey, H. Flewin *et al*.....	168 " 5	46.10	Nov. 26
Princess Royal	"	R. P. Rithet, W. Wilson *et al*.....	7 " 4	14.90	Dec. 15
Queen	"	B. C. Pyrites Co.	115 " 4	51.65	Aug. 27
Red Gulch.....	"	B. C. Pyrites Co.	113 " 4	31.00	" 27
Red Bluff.....	"	"	114 " 4	51.65	" 27
Twin Peaks.....	"	E. A. Cleveland & G. A. Kelly..... ..	38 " 4	51.65	" 22
Uta Fraction.....	"	E. A. Cleveland & G. A. Kelly	36 " 4	51.37	" 22

GOLD COMMISSIONERS AND MINING RECORDERS.

Mining Districts and Divisions.	Location of Office.	Gold Commissioner.	Mining Recorder.	Sub-Recorder.
Cassiar District	Telegraph Creek	James Porter		
Stikine	"		James Porter	
Liard	"		"	
Teslin Lake	Telegraph Creek		"	
Sub-office	Atlin			E. J. Thain.
Atlin District	Atlin	J. A. Fraser		
Atlin Lake	"		E. J. Thain	
Bennett Lake	Bennett		W. Dalby	
Chilkat	Wells		W. J. Rant	
Skeena District	Victoria	W. S. Gore		
Skeena River	Fort Simpson		John Flewin	
Sub-office	Masset			C. Harrison.
"	Kitsilas			S. A. Singlehurst.
"	Kitimat			Jas. Steele.
"	Essington			Chas. Berryman.
"	Skidegate, Q. C. I.			W. H. Dempster.
"	Bear River			John Conway.
"	Hazelton			John Kirby.
Bella Coola	Victoria		G. V. Cuppage	
Omineca District	Manson Creek	F. W. Valleau		
Omineca	"		F. W. Valleau	
Sub-office	Tom Creek			(Vacant.)
Cariboo District	Barkerville	John Bowron		
Cariboo	"		John McKen	
Quesnel	Quesnel Forks		W. Stephenson	
Sub-office	Harper's Camp			J. Mackay.
Lillooet District				
Clinton	Clinton	F. Soues	F. Soues	
Lillooet	Lillooet	C. Phair	C. Phair	
Kamloops District	Kamloops	G. C. Tunstall		
Kamloops	"		E. T. W. Pearse	
Sub-office	Nicola			Geo. Murray.
Asheroft	Asheroft		J. W. Burr	
Similkameen	Princeton		H. Hunter	
Sub-office	Nicola			Geo. Murray.
"	Hedley			F. M. Gillespie.
Yale	Yale		Wm. Dodd	
Vernon District	Vernon	L. Norris		
Vernon	"		Henry F. Wilmot (acting M. C.)	
Boundary District				
Osoyoos	Fairview	C. A. R. Lambly	J. R. Brown	
Sub-office	Olalla			D. Black.
Greenwood	Greenwood	W. G. McMynn	Geo. Cunningham	
Sub-office	Vernon			
"	Camp McKinney			H. Nicholson.
Grand Forks	Grand Forks	S. R. Almond	S. R. Almond	
Sub-office	Beaverdell			A. Megraw
Golden District	Golden	J. E. Griffith		
Golden	"		F. C. Lang	Chas. E. Hamilton.
Windermere	Windermere		John Bulman	
Fort Steele District	Fort Steele	J. F. Armstrong		
Fort Steele	"		L. W. Patmore	
Sub-office	Tobacco Plains			M. Phillipps.
"	Fernie			Lestock Forbes.
"	Cranbrook			F. R. Morris.
"	Kimberley			Stephen Hoskins.
"	Moyie			F. D. Hope.

Mining Districts and Divisions.	Location of Office.	Gold Commissioner.	Mining Recorder.	Sub-Recorder.
Revelstoke District	Revelstoke	Fred. Fraser		
Revelstoke	"		W. E. McLauchlin.	
Illecillewaet				
Lardeau	Camborne		Geo. Sumner	
Trout Lake	Trout Lake		F. C. Campbell	
Slocan District	Kaslo	E. E. Chipman		
Slocan	New Denver		Angus McInnes	
Sub-office	Sandon			E. M. Sandilands.
Slocan City	Slocan City		H. P. Christie	
Ainsworth	Kaslo		A. Lucas	
Sub-office	"			C. C. Daley.
"	Howser			Wm. Simpson.
Nelson District	Nelson	R. Renwick		
Nelson	"		Harry Wright	
Sub-office	Ymir			A. B. Buckworth
Goat River	Creston		W. N. Rolfe	
Arrow Lake	Nakusp		Walter Scott	
Rossland District	Rossland	John Kirkup		
Trail Creek	"		J. A. Hooson	
Nanaimo District	Nanaimo	Marshal Bray		
Nanaimo	"		Marshal Bray	
Sub-office	Alert Bay			Walter Woollacott.
Alberni District	Alberni	A. L. Smith		
Alberni	"		A. L. Smith	
West Coast V. I.	Clayoquot		W. T. Dawley	
Quatsino	Quatsino		E. E. Potts	
Victoria District	Victoria	W. S. Gore		
Victoria	"		G. V. Cuppage	
New Westminster	New Westminster.		D. Robson	
Sub-office	Harrison Lake			L. A. Agassiz.
"	Vancouver			R. J. Skinner.
"	Chilliwhack			J. Pelly.

DECISIONS

Of the Geographic Board of Canada, relating to Geographic Names in British Columbia.

By Order in Council dated December 18th, 1897, the Governor-General in Council was pleased to create a "Geographic Board," and was further "pleased to order and direct that all questions concerning geographic names in the Dominion which arise in the departments of the public service shall be referred to the Board, and that all departments shall use in their publications the names and orthography adopted by the Board."

At the request of the Dominion Government that the Provincial Government appoint a representative on the "Geographic Board," the Lieutenant-Governor in Council was pleased to appoint Wm. F. Robertson, Provincial Mineralogist, a member of the Board, representing British Columbia. The Fourth Report of the Board, containing a large number of rulings relating to British Columbia names, may be obtained from the Provincial Mineralogist, Victoria.

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